CITY OF TORONTO

SPECIFICATIONS

FOR A

BRIDGE

DON SECTION

BLOOR STREET VIADUCT

1914

DON BRIDGE

BLOOR STREET VIADUCT

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Brief Title of Contract: **DON BRIDGE, BLOOR STREET VIADUCT**

The tenderer's name and residence must be inserted here; and in case of firms, the name and residence of each and every member of the firm must be inserted.

Tender by residing at (or place of business), and residing at (or place of business), composing the firm of

or a Company duly incorporated by the and having their head office at

TO THE CHAIRMAN AND MEMBERS OF THE BOARD OF CONTROL:

1.

NOTE—In case a tender shall be submitted by or on behalf of any Corporation, it must be signed in the name of such Corporation by some duly authorized officer, or agent thereof, who shall also subscribe his own name and office; if practicable the seal of the Corporation should also be affixed.

DECLARE THAT of lawful age and the only person interested in this Tender; and no person other than herein above named has any interest in this Tender or in the Contract proposed to be taken.

2. FURTHER DECLARE that this Tender is made without any connection, knowledge, comparison of figures or arrangement with any other person or persons making a tender for the same work, and is in all respects fair and without collusion or fraud.

3. FURTHER DECLARE that no member of the City Council or any officer of the Corporation of the City of Toronto, is, shall be, or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise in or in the performance of the Contract, or in the supplies, work or business to which it relates or in any portion of the profits thereof, or of any such supplies to be used therein, or in any of the moneys to be derived therefrom.

4. FURTHER DECLARE that the several matters stated in the said Tender are in all respects true.

5. The undersigned having carefully examined the locality and site of the proposed works, as well as all the plans, drawings, profiles, form of agreement and bond relating thereto, and all the clauses in the Specifications, hereby accept the same as part and parcel of this contract, and do hereby tender and offer to enter into a contract to supply and do all therein called for, on the terms and conditions and under the provisions therein set forth, for the

sum of .....

.....

which sum is made up as follows:—

(NOTE.—If the following schedule is insufficient tenderer shall amplify same.)

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Clearing (practically complete).				
Grubbing .....(approx.)	.....	acre	.....	.....
Excavation for East Approach:—				
East of C.P.R. tracks, from present surface ground to finished slopes.....	.....	cu. yd.	.....	.....
East abutment and wing walls below finished surface of ground.....	.....	cu. yd.	.....	.....
North and south longitudinal walls below finished surface of ground.....	.....	cu. yd.	.....	.....
One cross wall below finished surface of ground	.....	cu. yd.	.....	.....
Four pedestals below finished surface of ground	.....	cu. yd.	.....	.....
The above prices for excavation are to include all backfilling, filling behind the abutment and wing walls, and disposing of the surplus material excavated as specified under Excavation and Filling.				

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Excavation for West Approach:—				
West abutment and wing walls		cu. yd.		
North and south longitudinal walls		cu. yd.		
Sixteen pedestals		cu. yd.		
Three cross walls		cu. yd.		
The above prices for excavation are to include all backfilling, filling behind the abutment, and wing walls, or otherwise disposing of the excavated material on the site of the west approach, as the Engineer may direct.				
The surplus material excavated, if any, shall be deposited on the Bloor Section, as specified under Excavation and Filling, at the following rate		cu. yd.		
Excavation for Main Piers:—				
Pier A, from finished surface of ground to elevation 293.5		cu. yd.		
Pier B, down to surface of shale, elevation 238.9		cu. yd.		
Pier B, shale down to elevation 234.9		cu. yd.		
Pier C, down to surface of shale, elevation 202.6		cu. yd.		
Pier C, shale down to elevation 198.6		cu. yd.		
Pier D, down to surface of shale, elevation 210.6		cu. yd.		
Pier D, shale down to elevation 206.6		cu. yd.		
Pier E, down to surface of shale, elevation 220.9		cu. yd.		

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Pier E, shale down to elevation 216.9		cu. yd.		
Pier F, from surface of ground to elevation 275.5		cu. yd.		
Pier F, adjacent ground shown on drawing No. 167		cu. yd.		
Pier G, from surface of ground to elevation 299.2		cu. yd.		
Loose Rock (if any)		cu. yd.		
The above prices shall cover the placing of all material excavated for main piers, on the Bloor Section, as specified under Excavation and Filling.				
Concrete in East Approach:—				
Footings for east abutment		cu. yd.		
Body of east abutment and wing walls, omitting parapet		cu. yd.		
Footings for north and south longitudinal walls		cu. yd.		
North and south longitudinal walls, from footings up to bottom of sidewalk slab		cu. yd.		
Footing for cross wall		cu. yd.		
Body of cross wall		cu. yd.		
Footings for four pedestals		cu. yd.		
Bodies of pedestals		cu. yd.		
Concrete in West Approach:—				
Footings for west abutment		cu. yd.		
Body of west abutment and wing walls, omitting parapet		cu. yd.		

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Footings for north and south longitudinal walls		cu. yd.		
North and south longitudinal walls, from footings up to bottom of sidewalk slab		cu. yd.		
Footings for sixteen pedestals		cu. yd.		
Sixteen pedestals above footings		cu. yd.		
Footings for three cross walls		cu. yd.		
Three cross walls above footings		cu. yd.		
Soffit of 80-ft Span		cu. yd.		
Side walls of 80-ft. Span		cu. yd.		
Concrete in Main Piers:—				
Pier A:				
Footing, elevation 293.5 to elevation 299.5		cu. yd.		
Body, elevation 299.5 to lower side of floor and sidewalk slabs		cu. yd.		
Pier B:				
Foundations, elevation 234.9 to elevation 267.9		cu. yd.		
Body, elevation 267.9 up to and including lower deck portion		cu. yd.		
Top, to lower side of floor and sidewalk slabs		cu. yd.		
Pier C:				
Foundations, elevation 198.6 to elevation 246.6		cu. yd.		
Body, elevation 246.6 up to and including lower deck portion		cu. yd.		

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Top, to lower side of floor and sidewalk slabs		cu. yd.		
Pier D:				
Foundations, elevation 206.6 to elevation 243.6		cu. yd.		
Body, elevation 243.6 up to and including lower deck portion		cu. yd.		
Top, to lower side of floor and sidewalk slabs		cu. yd.		
Pier E:				
Foundations, elevation 216.9 to elevation 255.9 on north, and 260.9 on south		cu. yd.		
Body, elevation 255.9 on north and 260.9 on south up to and including lower deck portion		cu. yd.		
Top, to lower side of floor and sidewalk slabs		cu. yd.		
Pier F:				
Footing, elevation 275.5 to elevation 281.5		cu. yd.		
Body, elevation 281.5 to lower deck		cu. yd.		
Top, to lower side of floor and sidewalk slabs		cu. yd.		
Pier G:				
Footing, elevation 299.2 to elevation 305.2		cu. yd.		
Body, elevation 305.2 to lower side of floor and sidewalk slabs		cu. yd.		

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Concrete in Floor:—				
Sidewalks between east and west abutments		cu. yd.		
Floorslab between east and west abutments, including curbs (exclusive of sidewalks)		cu. yd.		
Concrete encasing latticed stringers on outside between Piers A and F		cu. yd.		
Concrete parapet and railing on both sides complete, above top of sidewalk slab, including reinforcing steel		lin. ft.		
Reinforcing steel in East Approach below floor and sidewalk slabs		lb.		
Reinforcing steel in West Approach below floor and sidewalk slabs		lb.		
Reinforcing steel in floor:—				
Sidewalks between east and west abutments ..... Mesh		lb.		
Floorslabs between east and west abutments, including curbs (exclusive of sidewalks) ..... Rods		lb.		
Mesh		lb.		
Encased latticed stringers		lb.		
Reinforcing steel in Main Piers:—				
Pier A		lb.		
Pier B		lb.		
Pier C		lb.		
Pier D		lb.		

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Pier E		lb.		
Pier F		lb.		
Pier G		lb.		
Reinforcing Steel, 80-ft. Span:—				
In soffit		lb.		
In side walls		lb.		
Steelwork in East Approach:—				
Anchor bolts		lb.		
Sheet lead		lb.		
Wall plates and anchors		lb.		
Posts		lb.		
Bracing		lb.		
Floorbeams		lb.		
Stringers, upper deck		lb.		
Steelwork in West Approach:—				
Anchor bolts		lb.		
Sheet lead		lb.		
Wall plates and anchors		lb.		
Posts		lb.		
Bracing		lb.		
Floorbeams		lb.		
Stringers. upper deck		lb.		

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Steelwork in 80-ft. Span:—				
Anchor bolts		lb.		
Sheet lead		lb.		
Steel framing in soffit		lb.		
Bracing		lb.		
Steel framing in north and south walls		lb.		
Outer trusses		lb.		
Inner trusses		lb.		
Lower floorbeams		lb.		
Upper floorbeams		lb.		
Stringers. upper deck		lb.		
Steelwork for two 158-ft. Spans. Piers A to B and Piers E to F:—				
Anchor bolts		lb.		
Sheet lead		lb.		
Steel castings		lb.		
Pins		lb.		
Outer ribs, including posts		lb.		
Inner ribs, including posts		lb.		
Bracing (struts and diagonals)		lb.		
Lower floorbeams		lb.		
Upper floorbeams		lb.		
Stringers, upper deck		lb.		

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Steelwork for two 240-ft. Spans. Piers B to C and D to E:—				
Anchor bolts		lb.		
Sheet lead		lb.		
Steel castings		lb.		
Pins		lb.		
Outer ribs, including posts		lb.		
Inner ribs, including posts		lb.		
Bracing (struts and diagonals)		lb.		
Lower floorbeams		lb.		
Upper floorbeams		lb.		
Stringers, upper deck		lb.		
Steelwork for one 281 ft. 6 in. Span. Piers C to D:—				
Anchor bolts		lb.		
Sheet lead		lb.		
Steel castings		lb.		
Pins		lb.		
Outer ribs, including posts		lb.		
Inner ribs, including posts		lb.		
Bracing (struts and diagonals)		lb.		
Lower floorbeams		lb.		
Upper floorbeams		lb.		
Stringers, upper deck		lb.		

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Steelwork in upper parts of Piers A, B, C, D, E and F:—				
Anchor bolts		lb.		
Sheet lead		lb.		
Posts		lb.		
Bracing		lb.		
Floorbeams		lb.		
Stringers		lb.		
Metal in Expansion Joints:—				
Steel plates, etc		lb.		
Bolts		lb.		
Lead plugs		lb.		
Cast iron pedestals :—		lb.		
Metal in Drainage System:—				
Cast iron gullies and catch basins, with supports		lb.		
Waterproofing:—				
Track allowance, membrane and mastic		sq. yd.		
Roadway (including crossings), felt and waterproofing compound		sq. yd.		
Mastic, membrane, impregnated felt and tow, etc., for expansion joints.				
Granite Bearings:—				
Bearings under shoes of two 158-ft. spans		cu. ft.		
Bearings under shoes of two 240-ft. spans		cu. ft.		
Bearings under shoes of one 281 ft. 6 in. span		cu. ft.		

LOWER DECK MATERIAL (NOT INCLUDED ABOVE).

DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	AMOUNT
Steel in stringers and floor-beam stiffeners		lb.		
Concrete in slabs		cu. yd.		
Steel reinforcement in slabs		lb.		
Cast iron gullies		lb.		
Waterproofing, membrane and mastic		sq. yd.		
Mastic, membrane, impregnated felt and tow, etc., for expansion joints.				
			Total Bulk Sum Tender	

NOTE.—Extras and deductions on this contract will be made at the unit prices submitted in the above tender.

And also agree, if this Tender is accepted, to execute whatever additional or extra work may be required at the rates submitted in this Tender, including all charges for hauling, and delivery on the works, and (except in the case of materials only) in place complete, in strict conformity, in all respects, with the requirements of the specifications and form of agreement.

This offer is to continue open to acceptance until the formal contract is executed by the successful tenderer for said work, and the City may at any time without notice accept this tender whether any other tender has previously been accepted or not.

6. If this Tender is accepted, the undersigned agree to furnish approved sureties for the proper fulfilment of the Contract as required under the terms of the Specifications, and to execute the Agreement and Bond in triplicate within six days after being notified so to do by the City Solicitor. And in the event of default or failure on part so to do, agree that the Corporation of the City of Toronto shall be at liberty to retain the money deposited by to the use of the Corporation, and to accept the next lowest or any Tender, or to advertise for new Tenders; or to carry out the works in any other way they may deem best; and also agree to pay to the said Corporation the difference between this Tender and any greater sum which the said Corporation may expend or incur by reason of such default or failure, or by reason of such action, as aforesaid, on their part, including the cost of any advertisement for new tenders; and to indemnify and save harmless the said Corporation and their officers from all loss, damage, cost, charges and expense which they may suffer or be put to by reason of any such default or failure on part.

And agree that the awarding of the Contract, based on this Tender, by the Board of Control or City Council, shall be an acceptance of this Tender without communication or notice thereof to

7. And propose Mr.
of the City of Toronto, and Mr.
of the same place, as sureties, who are willing to become bound with the undersigned for the due performance of the Contract, for which this is a Tender.

Contractor's Signature. {.....

.....}

Witness.....

The undersigned hereby offer to become bound for the above named Contractor in the usual bond for the fulfilment of the above mentioned contract if awarded to

Signatures of Sureties {..... .....

....

.....}

Witness,.....

N. B.—Unless the "BONA FIDE" signatures of competent and satisfactory sureties are written above in their proper places, this Tender will not be entertained. Persons tendering are required to fill in all blanks. Should any uncertainty arise as to the proper manner of doing so, the requisite information will be given at the Engineer's Office.

All blanks must be legibly and properly filled in, or the Tender may be declared "INFORMAL."

A deposit in Cash or a marked cheque, payable to the order of the City Treasurer, for the sum of 2½ per cent. on the value of the accompanying Tender, must accompany each and every Tender, which deposit will be retained until the provisions of By-law 4.294 are complied with.

R. C. H.

DOMINION OF CANADA,
COUNTY OF YORK,
TO WIT:

IN THE MATTER of a proposed Contract for

DON BRIDGE, BLOOR STREET VIADUCT

DO SOLEMNLY DECLARE that the several matters stated in the above Tender are in all respects true.

And make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath, and by virtue of "The Canada Evidence Act, 1893."

SEVERALLY DECLARED before me at the City of Toronto, in the County of York, this day of 191

A Commissioner, etc.
(or Notary Public.)

OUTLINE OF WORK.

Scope

This contract includes in general the construction of the bridge required for the Don Section of the extension of Bloor Street from Sherbourne Street to the intersection of Broadview and Danforth Avenues; the different parts of the structure to be completed in accordance with these specifications, and left ready for traffic, excepting only in such particulars as are hereinafter specifically excluded.

Summary, Don Section

The work on this Section shall consist of:—

(*a*) Clearing and grubbing the eighty-six foot street allowance throughout the whole length of the section, and all portions of adjoining land on which excavation or filling are hereinafter specified to be done.

(*b*) Excavation, filling, backfilling, and otherwise disposing of excavated material, as specified elsewhere in detail.

(*c*) The construction of a bridge with wing walls and approaches, extending from Sta. 5 + 74.5 to Sta. 21 + 92 (chainage on tangent to centre line).

Excluded from contract

The contractor will not be required to furnish or place ballast, tracks, trolley poles, electric wires, lamp posts, block paving, sand cushion for the same, or water mains.

Contract drawings

The contract drawings are as follows:—

No. 1. General Survey.
2. Cross-Sections and Profile on Centre Line, Don Section.
7. Boring Diagram.
20. Finished Profile, Bloor, Rosedale and Don Sections.
29. Bench Marks and Reference Points.
34. Contour Plan.
35. Supplementary Borings.
36. General Drawing, Don Section.
101. Typical Cross-section at Steel Arches.
103. Upper Deck Slab, General Details.
104. Upper Deck Slab, Expansion Joints and Waterproofing.
111. Stress Sheet, Floor System over Steel Arches, Don Section.
112. Stress Diagram, 158 ft. 0 in. Arch.
113. Lower Bearings, 158 ft. 0 in. Arch.
114. Ribs, 158 ft. 0 in. Arch.
115. Cross-sections, 158 ft. 0 in. Arch.
119. Stress Diagram, Inner Rib, 240 ft. 0 in. Arch.
120. Stress Diagram, Outer Rib, 240 ft. 0 in. Arch.
121. Layout of Horizontal Curves.
122. Hinge Reactions Steel Arches.

123. Lower Bearing Details, 240 ft. 0 in. Arch.
124. Lower Bearing Details, 281 ft. 6 in. Arch.
125. Ribs, Part I, 240 ft. 0 in. Arch.
126. Ribs, Part II, 240 ft. 0 in. Arch.
127. Cross-sections at L1, U1; L2, U2; L3, U3; 240 ft. 0 in. Arch.
128. Cross-sections at L4, U4; L5, U5; L6, U6; 240 ft. 0 in. Arch.
130. Stress Sheet, Floor System, Approaches, Don Section.
131. Stress Diagram, Inner Rib, 281 ft. 6 in. Arch.
132. Stress Diagram, Outer Rib, 281 ft. 6 in. Arch.
133. Stress Diagram, Polygons, 281 ft. 6 in. Arch.
134. Ribs, Part I, 281 ft. 6 in. Arch.
135. Ribs, Part II, 281 ft. 6 in. Arch.
136. Cross-sections at L1, U1; L2, U2; L3, U3; 281 ft. 6 in. Arch.
137. Cross-sections at L4, U4; L5, U5; L6, U6; L7, U7; 281 ft. 6 in. Arch.
138. Location of Floorbeams and Pins.
140. Stress Diagram for Wind Loads, Steel Arches.
141. Typical Expansion Bearings, Don Section.
142. Service Location on Bridges.
143. Drain Details on Bridges.
146. Top Portion Piers B., C., D., and E.
147. Subway Floor Portion Piers B., C., D., and E.
148. Middle Portion Piers B., C., D., and E.
149. Base Portion Pier B.
150. Base Portion Piers C and D.
151. Base Portion Pier E.
153. Handrail over Steel Arches.
154. Handrail over Approaches, Don Section.
155. Handrail over Abutments, Don Section.
156. Top Portion Piers F. and A.
157. Middle Portion Pier F.
158. Base Portion Pier F.
159. Middle and Base Portions Pier A.
160. Soffit, 80-ft. Span, Don Section
161. Stress Diagram for Trusses, 80-ft. Span, Don Section.
162. Steel in Wall, 80-ft. Span, Don Section.
163. Typical Details, Trusses, 80-ft. Span, Don Section.
164. East Abutment, Don Section.
166. Side Walls and Footings, East Approach, Don Section.
167. Foundation Plan, Piers A. to G.
169. Side Walls, West Approach, Don Section.
170. West Abutment, Don Section.
171. Pier G.
172. Footings, Part I, West Approach, Don Section.
173. Footings, Part II, West Approach, Don Section.

174. Steel Columns and Bracing in Piers, Don Section.
175. Steel Columns and Bracing in Approaches, Don Section.
176. Cut, East Approach, Don Section.
177. Side Walls, 80-ft. Span.

To these will be added drawings referring to all parts of the lower deck not shown on the drawings already mentioned; and when comuleted these additional drawings will be furnished to intending bidders.

Drawings a part of Specifications

The above drawings shall form a part of these specifications, and anything shown on the drawings but not otherwise specified, or specified but not shown on the drawings, shall be considered as forming part of this contract, unless expressly excluded herein.

These specifications are divided into sections merely for reference, and the contractor shall, during each operation, carry out the work in accordance with their meaning and purpose as a whole.

Engineer's estimate

On application to the Commisioner of Works, bidders wil be furnished with a copy of the Engineer's estimate of quantities of materials, excavation, etc., required for the construction and completion of the work as detailed herein. This estimate is furnished only as a general guide to bidders and others, prior to submitting tenders, but each bidder must make his own estimate of quantities and base his tender upon the same, irrespective of any estimate furnished for his guidance by the Engineer.

EXCAVATION AND FILLING.

Extent of work

This portion of the specifications includes the clearing, grubbing, excavation, backfilling, and otherwise disposing of material itemized in the schedule forming part of the Form of Tender.

Clearing and grubbing

The contractor shall clear and grub the whole of the site of the Don Section of the Viaduct, from Sta. 16 + 00 westward to the intersection with the Rosedale Section.

In general the width to be cleared and grubed is eighty-six (86) feet. The contractor shall also clear and grub all ground outside of the 86-ft. strip on which excavation is required to be done.

The greater portion of the trees have been cleared from the above. The contractor shall remove the remaining trees and shrubs and remove all stumps and roots.

Explosives

If explosives are used, the contractor shall be liable for all damage due to their use.

Nature of materials

Exploration of sub-surface conditions has been made by means of wash borings, carried

in many cases down to the shale, after which diamond drills were used to obtain cores of the shale. The information obtained concerning the nature and depth of the strata penetrated are recorded on drawings Nos. 7 and 35. Samples and cores taken during these operations were labelled and preserved and may be examined by intending bidders.

The term "boulders" when used in drawings Nos. 7 and 35, means stones large enough to resist the action of the wash bit and the driving of the casing pipe.

Classification

The material to be excavated shall be classified as Solid Rock, Loose Rock, and Common Excavation.

Soild Rock shall include all rock in place which cannot be removed by hand, pick, or bar, and all other masses of rock more than one cubic yard, which, in the judgment of the Engineer, may be best removed by blasting.

Loose Rock shall include all stones and boulders measuring more than one cubic foot and less than one cubic yard, and all rock, whether in place or otherwise, which can be removed by hand, pick, or bar. Under this term shall also be included firmly cemented gravel or sand, and clay which is so hardened that it cannot be rubbed to a paste in the hand when mixed with water.

Common Excavation will include all material not above included in Solid Rock or Loose Rock. This term applies to class of material only and not to method of doing the work.

Surface of rock

The surface of the rock indicated on the detail drawings of foundations, refers to the elevation of the surface of the shale, as determined by the borings. In making up tenders all excavation below this elevation is to be classified as Solid Rock, and all excavation above this elevation is to be classified as Common Excavation.

Allowances and deductions

The material excavated shall, however, be classified as Solid Rock, Loose Rock, and Common Excavation, and in case of variation from the conditions mentioned in the preceding paragraph and the drawings, either as regards class of material or depth at which excavation is done, extras shall be allowed, or deductions made in accordance with the schedule.

Approval of excavation

No concrete or other material shall be placed in the excavation until the latter has been approved and classification made.

Measurements, how made

All measurements of quantities shall be made in excavation.

In estimating open excavation, the contractor shall figure on carrying the sides down vertically so as to enclose an area whose length and width are each one foot greater than the corresponding dimensions of the footing. He shall protect the same against caving, and shall not be entitled to aditional remuneration for removing material which may fall into the excavation.

In case the material is such that the contractor succeeds in excavating to the exact dimensions of the footing, no deduction shall be made from the contract price on account of thus decreasing the length and width of the excavation by one foot.

Unwatering

The contractor shall, at his own expense, do all unwatering required in connection with the excavation. No concrete shall be deposited under water.

Filling and Backfilling

Filling and backfilling around all concrete work and behind abutments and retaining walls shall be rammed into place and puddled as the work progresses; and the surface of the ground shall be brought to the finished elevations shown on the drawings.

Embankment

All material excavated in connection with the east approach of the Don bridge and placed outside of the 86-ft. strip, shall be deposited in such places and in such a manner as will be satisfactory to the Engineer as well as to the owners of the land on which it is placed. The contractor shall, before so placing any material, procure and furnish to the City the owner's written permission to so dispose of the same.

Excavated material to be deposited on the Bloor Section shall be placed in such place or places and in such manner as the Engineer may direct, so as to form part of the fill required there.

Before placing any material in embankment, the surface of the ground shall be stripped of all trees, sod, or other objectionable material, and ploughed or otherwise loosened, so as to form a bond with the freshly-placed material.

Drainage

Drains of approved type shall be placed as the Engineer may direct, to prevent water collecting between the surface of the original ground and the lower surface of the fill. This drainage will be paid for on the basis of cost plus fifteen per cent.

CONCRETE (PLAIN AND REINFORCED).

Extent of Work.

General

This portion of the specification is intended to cover the supply of the materials for, and the construction of all concrete work, plain or reinforced, as shown on the drawings and set forth in these specifications, excepting concrete piling, if any. The concrete necessary to encase the stringers, floorbeams, columns and bracing east of Pier A. and west of Pier F. should such be required, will be paid for as an extra.

This portion of the contract includes the supply and placing of all waterproofing, gullies, catch basins, hook bolts from slab to top flanges of stringers, and metal or other material in expansion joints of concrete walls, floorslabs, and sidewalk slabs. It also includes the supply and placing of granite bearing blocks for the arch ribs.

Approval of engineer

The contractor shall, before ordering reinforcing steel, make a complete list of the same with sketches of details and shall submit it to the Engineer for approval.

Assumptions Governing Design.

Dead and live loads

The different portions of the concrete work are designed in acordance with the live and dead loads specified under Structural Steel and Iron Work.

Impact

The combined deal and live load stresses are increased by the quotient of the square of the live load stress, divided by the sum of the dead and live load stresses. Only railway loads are considered as producing impact.

Live load increment

For spans under eighty (80) feet, the live load is multiplied by the factor $(1.40 - \frac{L}{200})$, in which L is the loaded distance in feet producing the maximum stress. This new loading is then considered the live load, and the impact allowance is calculated as above.

Distribution of upper deck loads

The rails and ballast are assumed to distribute each wheel load uniformly over a length of five feet.

The load on each track is assumed to be distributed over a width equal to the length of ties plus one foot.

In calculating bending stresses produced in the slab by the twenty-ton truck, each wheel load is assumed to be distributed over a square, each side of which is equal to nine (9) inches, plus the effective depth of the slab.

In calculating punching shear produced in the slab by the twenty-ton truck, the area of contact is considered as a square nine (9) inches to the side.

Length of span, slabs and beams

The length of span for reinforced concrete subjected to bending, shall, in general, be considered to be the distance centre to centre of supports.

Bending moments on slabs as affected by continuity

All slabs are considered, unless otherwise shown on the drawings, to be partially continuous and shall have reinforcing in the upper portions at the supports.

In all such cases the maximum positive bending moment in each individual span is taken as eight-tenths of that which would be produced in the same span resting freely on two supports, and the negative bending moment over intermediate supports is taken as ten-twelfths of the maximum positive bending moment in an adjacent span.

Methods of stress analysis

For beams and slabs the method generally known as the straight line formula, has been used, based on the following assumptions:—

(*a*) All tensile stresses are considered to resisted entirely by the steel reinforcing.

(*b*) There are no initial stresses in the beams.

(*c*) All shearing strain is cared for and there is no slipping between concrete and steel.

(*d*) The modulus of elasticity of concrete in compression is constant up to the limit of the allowable working stress.

(*e*) A section, plane before bending, remains plane after bending, that is, the stress on any fibre is directly proportional to its distance from the neutral axis.

Diagonal tension

Diagonal tension existing simultaneously with the maximum bending moment is considered as provided for by the concrete without web reinforcement, when the quotient of the vertical shear and the area between the centre of steel and centre of compression in the concrete does not exceed 50 lbs. per square inch.

Punching of slab

Punching is assumed to be resisted by an area of concrete equal to the perimeter of the area of contact multiplied by the effective depth of the slab, and shall be considered as provided for by the concrete alone when the shear on this area does not exceed 100 lbs. per square inch.

Unit stresses

The following are assumed working stresses in pounds per square inch:—

Tension in Steel reinforcement	15,000
Compression in extreme fibres in bending	500
Modulus of elasticity of concrete	1,500,000
Modulus of elasticity of steel	30,000,000
Compression on 1:2:4 concrete under bearing plates and pad stones	400
Compression on 1:2½:5 concrete in body of pier	350
Compression on 1:3:5 concrete in caissons	300
Bond between deformed bars and concrete	100

Cement.

General

Only Portland cement of approved manufacture shall be used.

Cement shall be delivered in suitable packages with the brand and name of the manufacturer plainly marked thereon.

The cement shall be stored in a suitable weather-tight building, in such a manner as to permit of easy access for proper inspection and identification of each shipment.

All cement shall be inspected after delivery at the site.

To allow sufficient time for this purpose and to provide against delays due to non-delivery, etc., all cement shall be delivered at the site and stored at least six weeks before it shall be required for use.

Tests

All cement shall fulfil the physical and chemical requirements of the standard specifications for Portland Cement adopted by the Canadian Society of Civil Engineers in 1910, and revised in 1911, which are hereby made part of these specifications.

All tests shall be made in accordance with the methods for testing cement described in the above specifications.

Rejection

Rejection shall be by shipments and all rejected cement shall be removed by the contractor at once from the vicinity of the work.

Sand.

General

All sand shall be clean, sharp, hard, and free from vegetable matter, mica, or other unsuitable substance, and shall be entirely free from any impurities adhering to the surface of the same.

Silica

It shall contain at least 95 per cent. of Silica.

Fineness

It shall all pass a screen of four meshes to the linear inch; not more than 5 per cent. shall pass a sieve of 100 meshes to the linear inch, and it shall be well graded from fine to coarse.

Representative sample and tests

Before acceptance of sand from any source the contractor and the Engineer shall select from the source of supply a representative sample, which shall be subject to tests above mentioned and to comparative physical tests with standard Ottawa sand.

Comparative Test

The sand when tested with a normal Portland Cement mortar in the proportion of one part of cement to three parts of sand, according to standard methods, shall develop at least 150 per cent. of the strength developed in similarly proportioned mortar of the same cement and standard Ottawa sand. In no case, however, shall such sample mortar under investigation in a 1:3 mixture briquette, when tested in tension, fail at less than 300 pounds at seven days or 400 pounds at twenty-eight days.

Tests subsequent to delivery

Sand, as delivered, shall be tested from time to time as the Engineer may require. It shall fulfil the above requirements as regards composition and fineness. It shall also be subjected to the above described tests and shall develop at seven days under similar methods of testing and gauging, the full strength of the original sample shown by the preliminary tests under which that sample was approved.

Access to source of supply

The contractor shall at all times provide the Engineer access to each place from which sand for this work is being procured, and such facilities for examining the same as he shall require to satisfy himself that a uniform quality of sand is being furnished.

Screening and washing

Sand shall be screened and washed if the Engineer so requires.

Rejected sand

Rejected sand shall at once be removed from the vicinity of the work or used as filling, without cost to the City.

Broken Stone.

Kind of stone

All broken stone shall be of approved quality, hardness and toughness. It shall be free from all dirt, screenings, long thin scales, and unsuitable stone.

Gradation

It shall in each case be retained on one-quarter inch mesh, and well graded up to the maximum size specified for that particular class of concrete.

Maximum sizes of stone

Class of Work	Diam. of ring through which largest stone shall pass
Floor Slab	1½ inch.
Walls less than 24-in. thick	1½ "
Walls 24-in. to 36-in. thick	2 "
Walls over 36 inches thick	3 "
Footing Courses	2½ "
Massive parts of Foundations, Abutments and Piers	3 "
Concrete under bearing plates or stones	1½ "

For other special work, the maximum size shall be as noted elsewhere in these specifications or drawings, or as the Engineer shall direct.

One-man stones

In such cases only as the Engineer may approve, one-man stones may be embedded in the concrete. Such stones shall be sound, hard, and perfectly clean, and shall be thoroughly wet before placing. They shall be laid with their largest face down and shall not be placed nearer than one foot to the surface of the work or to each other.

Comprehensive strength of stone

All stone shall be sufficiently strong that the compressive strength of the concrete will not be limited by that of the stone.

Water.

The water used for making concrete shall be taken from the city system, and paid for by the contractor, who shall comply with all laws and regulations relative to the use of same.

Reinforcing Bars.

Deformed bars

Except in cases where round bars are shown on the drawings, all bar reinforcement shall consist of square bars twisted cold, or of such other type of deformed bars as may be approved by the Engineer.

Process

Only medium open hearth steel shall be used.

The bars shall be rolled from new billets. No re-rolled material will be accepted.

Bars shall be twisted cold with one complete twist in a length not over twelve times the thickness of the bar.

Tests

Cold twisted bars shall be tested before twisting. The bars shall be inspected and tested subject to the specifications given for plates, shapes, and bars, in the portion of these specifications relating to Structural Steel and Iron Work. They may also at any time after twisting, be subjected to the following bend test:—

The test specimen shall bend 180 degs. cold around a pin without cracking on the outside of the bent portion. For bars under ¾-in. in thickness the diameter of the pin shall be twice the thickness of the bar, and for bars ¾-in. thick or over, the diameter of the pin shall be three times the thickness of the bar.

Inspection during twisting

The City's Inspector shall have full access to the works where the bars are twisted.

Finish

The finished bars shall be free from injurious defects and shall have a workmanlike finish.

Mesh Reinforcement.

Kind

This shall consist of expanded metal or such other type of mesh reinforcement as may be approved by the Engineer.

Samples

The contractor shall submit to the Engineer as many and as large samples of material proposed to be used, as the Engineer may require; and only such samples as are satisfactory to him shall be approved.

Tests

Each lot of material delivered shall be tested as the Engineer may direct, and will be rejected unless equal in all respects to the samples approved.

Proportioning Mixing and Placing.

Proportions

All concrete in the structure shall be mixed in the proportions by volume shown on the drawings, all materials being measured loose. One hundred pounds of cement shall constitute one cubic foot.

Excess Mortar

In any mixture the matrix (cement and sand mortar), shall exceed by 20 per cent. the voids in the broken stone, and in the case of the floor slab, the excess shall be 25 per cent.

Varying proportions

The proportions which sand and stone bear to each other in the aggregate shall be varied from the foregoing as the Engineer may require, to reduce the voids in the aggregate, without entitling the contractor to extra compensation.

Additional cement added on the order of the Engineer, shall be paid for as an extra at cost delivered at the mixer.

Additional cement will be required to provide a 1:2:4 mixture under each bearing of steelwork, extending such distance from the bearing as the Engineer may direct.

Machine mixing

All mixing shall be by approved machinery, except such hand mixing as may be allowed by special arrangement with the Engineer. Preference will be given to revolving batch machines. Continuous mixers will not be permitted. Mixing must be very carefully and thoroughly done. The consistency of the mixture for each class of work shall be determined by the Engineer.

Tamping

All concrete, whether massive or reinforced, must be thoroughly tamped. This shall be carried on continuously during the process of placing the concrete and by means of proper tools. Special care should be taken in tamping concrete next to forms in order to insure that the mortar is flushed thoroughly against the latter.

No re-tempering

No concrete shall be placed after the initial set has taken place. Re-tempering will not be permitted.

Transportation

Concrete shall be carried and placed as rapidly as possible after mixing. No method will be allowed which tends to separate the ingredients.

Joints

The mixing and placing of concrete will be as far as practicable a continuous operation, and when it is necessary to make joints they shall be located in such places and formed in such manner as directed by the Engineer.

Bonding

When it is necessary to bond new concrete to concrete partially or wholly set, the Engineer may require that the surfaces of the old concrete be cleaned, roughened, thoroughly soaked, and then a coat of rich cement mortar applied.

It will always be required that the old concrete next to the form shall be removed for two inches from the form and two inches from the surface, to avoid the appearance of a joint.

Depth of layers

All concrete, unless very wet, shall be placed in horizontal layers of uniform thickness, not exceeding 8 inches.

Care in finishing moulding

The contractor shall take special care that the concrete for mouldings, panels, and all ornamental parts, is thoroughly worked into place so as to properly fill the moulds and leave all surfaces true, with no coarse aggregate exposed.

Expansion joints

Expansion joints shall be formed as shown on the drawings. Where not shown in detail the surfaces on each side of the joint shall be separated by tar paper. In order to secure a smooth enough contact between two bodies of concrete to permit sliding, sheet zinc shall be used, where required by the Engineer.

Protection of work

Finished concrete shall be protected against disturbance until thoroughly hardened.

Concrete must be kept wet for one week after depositing and in dry hot weather must, in addition, be kept covered from exposure to the sun during this time, or must be constantly sprinkled during the day by workmen especially detailed for this work.

In cold weather when there is a liability to freezing, the concrete shall be suitably protected, to the satisfaction of the Engineer.

Damage

The contractor shall take such precautions as the Engineer may deem necessary to prevent damage to parts of the structure already in place, and he shall make good, to the satisfaction of the Engineer, any such damage caused by him.

Attention is particularly called to the necessity of keeping steelwork clean from drippings when the slab is being placed.

Test blocks

The Engineer will, from time to time, as the work progresses, make test blocks of the concrete as deposited, for the purpose of record.

Clearing site

The contractor shall remove all his falsework, plant, and surplus materials, as well as any rubbish accumulated on account of his operations, and shall leave the site in a neat and tidy condition.

Placing Reinforcement.

Metal to be clean

All metal must be free from scale, grease, paint, dirt, or injurious rust, before being placed in the concrete.

Location

Reinforcement shall be carefully placed as shown on the drawings, and maintained in correct position during the placing of the concrete, by means of suitable supports and wiring at intersections where necessary.

Bends

Abrupt bends shall be avoided, and, when required by the Engineer, rods shall be bent to templet.

Forms.

Strength

All forms for moulded concrete work must be constructed of sufficient strength to obtain the necessary rigidity to prevent any motion of the forms while concrete is being placed; and shall be strong enough to carry, without movement, any load which may come upon the concrete within 30 days from the date of placing the concrete.

Proportioning forms

In proportioning forms and centering, concrete shall be treated as a liquid of its full weight for vertical loads, and one-half its weight for horizontal pressures.

Material for forms

Forms for all surfaces that will be exposed in the finished work shall be made of sound, straight, tongued and grooved planking, at least one and three-quarters inches thick, dressed

on the inside to a smooth surface, and so matched that the surface of the concrete will not show any impression whatever of the joints.

Forms for other work may be made of undressed lumber, but the joints must be sufficiently tight to prevent any loss of cement through leakage. All work to a depth of eighteen inches below the finished ground shall be treated as "exposed work," except the inside surfaces of approaches and hollow piers.

For casting all ornamental work such as mouldings, parapet, balustrade, curved surfaces, and all work of a special nature, only material and methods approved by the Engineer shall be employed.

Any variation from the type of forms specified above, must be approved by the Engineer before being used.

Forms shall be constructed so that they can be removed from the bottom upward.

Workmanship

Forms shall be constructed by experienced and capable workmen only, and shall be true to line and grade, and of first-class workmanship throughout.

Clean forms

Forms which are used more than once shall be carefully cleaned off after each using.

Great care must be taken to clean all sawdust, dirt and debris from forms just before placing concrete, and whenever necessary, form shall be cleaned out by steam jet or equally effective means.

All forms shall be so constructed as to be readily cleaned.

Care must be taken that face surfaces of forms do not become splashed with concrete which will take its initial set before being covered by the main body of concrete. Splashes that have taken such initial set shall be carefully removed and the surface of the form again oiled or soaped.

Easily removed

All forms shall be designed so that they may be removed with as little damage as possible to the concrete.

Oil or soap

In order to prevent the concrete from sticking, all forms for exposed work shall be oiled or soaped on the side next the finished work. The oil to be used shall be thick enough to act as a filler, that quality known as "sludge" being recommended. If soap is used it shall be mixed with enough water to make a thin jelly. When forms are used more than once they shall be carefully cleaned and shall then be given another coat of oil or soap.

Removal of forms

No forms whatever shall be removed at any time without first notifying the Engineer in charge, who shall ascertain if the concrete be set sufficiently hard and so notify the contractor. But such notification shall not be considered to relieve the contractor of responsibility for the structure and for the removal of such forms.

Projecting wires, etc.

All projecting wires and bolts, or other devices that are used for holding forms and that pass through the concrete, shall be cut off at least one inch beneath the finished surface and the ends covered with mortar of the same mix as used in the body of the work.

Spreaders

Form spreaders shall preferably be constructed of concrete and shall contain holes for bolting the forms in position. Such spreaders shall be of approved type.

If wood spreaders be used they shall be removed while the concrete is being placed.

Granite Bearings.

Material

These shall be of first-class granite; hardness, closeness of grain, and durability being especially important.

Size

The blocks shall be of such size that not more than two will be required for any bearing. They shall be at least two feet thick when dressed ready to place. Each pair must be of the same size and shape.

Placing

They shall be placed in the positions shewn on the drawings so that at least two inches of the upper surface of each will have to be dressed off in order to form the finished bearing for the shoe. The concrete around each shall be kept one inch below the position of this finished bearing and the blocks shall be embedded at least one foot nine inches in the concrete

The contractor shall take special care to have these blocks lined up properly across the centre line of the bridge, and shall, before concreting around them, carefully check the distance between the bearings at opposite ends of each span, and he shall be responsible for the correctness of their position. The blocks shall be well bedded in place.

Approval of engineer

No granite block shall be accepted unless it is satisfactory to the Engineer in every respect.

Surface Finish.

Unexposed surfaces

The inner surfaces of abutments and hollow piers and surfaces of neatwork more than eighteen inches below the finished surface of the ground, shall have the forms removed and cavities filled with mortar as the Engineer may require.

Partially exposed surfaces

The bottom of the roadway, railway and sidewalk slabs over the steel arch spans, the intrados of the 80-ft. spans, and the inside face of the concrete encasing the outer stringers shall be considered as partially exposed surfaces. After removal of forms, all cavities shall be filled with a mortar of the same proportions as used in the concrete, and all projections, rough spots, or blemishes, shall be rubbed off.

Sidewalk surface

The sidewalk slabs, along with all curbs and gutters, shall have a granolithic surface layer three-quarters of an inch thick, consisting of one part cement, one part coarse sand or gravel,

and two parts broken stone, made into a mortar of proper consistency. The stone shall be clean crushed rock of approved quality and colour, passing a 3-8 in. sieve and retained on a ¼-in. sieve. For vertical surfaces the mixture shall be deposited against the face forms by skilled workmen as the placing of concrete proceeds.

The face forms shall be removed as soon as the concrete has sufficiently hardened, and any voids that may appear shall be filled with the mixture. For horizontal surfaces the mixture shall be deposited on the main body of the concrete immediately after the same has been tamped and before it has set. The top layer shall be well tamped to insure a bond with the rest of the slab, and the surface shall be properly worked, trued up with a straight edge, and floated.

The surface shall be marked off into panels by cutting joints, as the Engineer may direct, through the veneer layer only, and finishing same with a suitable tool.

Such parts of the panel as the Engineer may require shall be finished with a dot roller and the balance given a brush finish.

Parapet, including balustrade

The concrete shall consist of 1 part cement, 1½ parts sand, and 2½ parts crushed granite or other approved stone, of such size as may be determined by the Engineer.

The base of the balustrade shall be placed at the same time as the sidewalk slab. When partially set, the forms shall be removed and the surface scrubbed with wire brushes so as to expose the dark coloured aggregate.

The balusters shall be cast separately and upon removal from the moulds shall be similarly scrubbed, rubbed to true form with a workmanlike finish and immersed in clean water for five days. They shall be placed as shewn on the detail drawings and shall be firmly grounted in position.

The top rail and the solid parts of the parapet shall be cast in place and scrubbed similarly to the base.

All portions cast in place shall be carefully protected from the sun and kept moist for such period as the Engineer may require.

Metal moulds shall be used for the above unless otherwise permitted by the Engineer.

If necessary to satisfactorily clean the surface, the contractor will be required to wash it with acid.

Rubbed surface

All exposed surfaces, unless otherwise specified above, shall receive a rubbed finish which shall consist essentially of the following: As soon as the forms are removed and all cavities filled with mortar of the same proportions as used in the concrete, the surface of the concrete shall be thoroughly rubbed with sandstone or carborundum brick until all impression of the timber

of forms or other irregularities are removed. As a final finish, the sandstone or carborundum brick shall be dipped in a cement grout wash composed of one (1) part cement to two (2) parts fine sand, and the concrete surface shall be rubbed until a clean finish is obtained.

If any portion of the surface shall become dried out before being finished, it shall be thoroughly soaked before receiving the final operation of finishing.

The grout surfacing herein specified shall, in no case, be used for the purpose of producing a plaster coating to cover irregularities of surface produced by sagging or other similar defects in forms.

All face surfaces shall be left thoroughly clean upon the completion of the work.

Top of roadway and railway slabs

After the slabs have been placed, the surface to be waterproofed shall be given a broomed finish free from all sharp projections or offsets of any character, except those shown on the plans.

Provision for Public Utilities.

Water mains

The contractor shall provide in abutments openings for two (2) forty-two-inch water mains, indicated on drawings, and shall properly reinforce the concrete around these openings.

Ducts for telephone wires

The contractor shall provide in abutments and piers, suitable openings for six (6) telephone ducts, indicated on drawings. He shall imbed in the concrete, pipes to carry the same, and shall place in the sidewalk slab, manhole frames and covers, all as directed by the Engineer.

Ducts for other wires

The contractor shall imbed in the concrete such ducts as the Engineer may require to protect wires for light and power on the bridge. Each duct will consist of a short length of galvanized iron pipe to carry wires from beneath the slab through the same to the bottom of the lamp post or railway pole as the case may be. One will be required for each lamp post and not more than three will be required for the railway feeders.

Payment

All such pipes and ducts, manhole frames and covers, imbedded in the concrete, shall be provided by the City. All labour of placing them shall, however, be performed as part of this contract without additional compensation.

Drainage.

Slab

The contractor shall, under this contract, provide and place gullies and catch basins, as shown on drawings.

The system of conductor troughs and down spouts, together with the erection of the same, shall not be included in this contract.

Drainage as directed by the engineer

For all other portions of the structure where the Engineer considers drainage necessary, he shall direct the contractor as to the methods of carrying out the same, and such work shall be paid for on the basis of cost, plus fifteen per cent.

This shall not be construed so as to recompense the contractor for unwatering excavations during construction, but refers only to permanent drainage.

Waterproofing.

Slab under tracks

The slabs under the tracks shall be completely waterproofed by a membrane covered with mastic, which shall be flashed up on the curbs, sealed there, and properly finished at all expansion joints as shown on the detail drawings.

After the slab has properly hardened and dried, the surface shall be thoroughly cleaned and given a priming coat. After this has been allowed to dry there shall then be applied with mops a heavy coating of waterproofing compound, properly heated, and while it is still hot there shall be carefully and smoothly laid, a layer of 8-ounce burlap. This shall be thoroughly mopped with the waterproofing compound, in which shall be laid a layer of waterproofed felt. Another layer each of 8-ounce burlap and waterproofed felt, well mopped with the waterproofing compound, will complete the membrane.

On this shall be laid a 1½-inch thickness of mastic, in two layers, with joints lapped at least 12 inches.

Roadway slab

The surface shall receive a priming coat as in the case of the slab under the tracks. It shall then receive one good coat of waterproofing compound mopped on hot, one thickness of waterproofed felt and another good coat of hot waterproofing compound.

Expansion joints

Where expansion joints are flashed with the membrane all four layers shall be of 8-ounce burlap with joints properly broken.

Approval of engineer

All materials shall be equal to the best in use for such purposes and shall be subject to the approval of the Engineer.

Only expert workmen shall be employed, the best methods used, and the work thoroughly done.

STRUCTURAL STEEL AND IRON WORK.

General.

Scope of work

This portion of the specifications covers the supply and erection of all steel and iron required for the completion of the Don Section of the Bloor Street Viaduct, except as follows:—

Reinforcement for Concrete;
Drainage System;
Hook bolts from slab to top flanges of stringers.
Metal in expansion joints of concrete walls, floor slab, and sidewalk slab.

Assumptions Governing Design.

Lower deck clearance

The steelwork is arranged to provide for the future traffic on the lower level, the clearance indicated in Fig. 4.

Clearance is also provided for installation of two forty-two-inch water mains, as shown on drawing No. 101.

Dead loads

For purposes of stress computation the weights of the different substances are assumed as follows:—

Concrete (plain or reinforced)	150 lbs. per cu. ft.
Steel, as ordinarily listed per lineal foot.	
Broken stone ballast	100 lbs. per cu. ft.
Timber ties	54 lbs. per cu. ft.
4-inch wood block paving and ½-inch sand cushion	25 lbs. per sq. ft.
Rammed sand or gravel	125 lbs. per cu. ft.
Loose sand and earth	100 lbs. per cu. ft.

Live loads, upper deck

The floor system and posts are designed to carry on each track two 50-ton electric cars, producing loads as indicated in Fig. 1.

(*a*) Electric railway

The arches and foundations are designed for a uniform load of 1,600 pounds per lineal foot of track.

(*b*) Roadway

The floor system and posts are designed for greatest stresses produced by either of the following:—

(1) A uniform load of 135 lbs. per square foot on the area remaining after deducting a strip 22 ft. wide for tracks.

(2) A 20-ton truck producing loads as shown in Fig. 2.

The arches and foundations are designed for a uniform load of 80 pounds per square foot

for spans of 200 feet or over, and $80 + \frac{200\text{-}S}{5}$ pounds per square foot for spans under 200 feet. (S = span in feet).

(c) Sidewalk

The slab, stringers, and posts, are designed for a uniform load of 100 pounds per square foot and the arches and foundations for a uniform load of 80 pounds per square foot.

Live load, lower deck

The loading for each track consists of a train of cars as shown in Fig. 3.

Impact

The members are designed to include impact and live load increment as indicated on the stress sheets.

Wind

The bridge is designed for a wind pressure of 50 pounds per square foot on the unloaded structure. For the upper deck the wind pressure is assumed to act on a vertical surface, ten feet in height from bottom of stringers upward. For the lower deck it is assumed to act on a vertical surface four feet in height taken twice.

For the truss members and posts it is assumed to act on twice the exposed area of one rib.

Unit stresses

Each part of the structure shall be so proportioned that the maximum condition of stress in pounds per square inch shall not exceed the following:—

Axial tension on net section of rolled plates and shapes	16,000

Axial compression on gross section of rolled plates and shapes:—

For flat or fixed ends, $16000 \div \left(1 + \frac{L^2}{18000\ r^2}\right)$

For one flat and one pin end, $16000 \div \left(1 + \frac{L^2}{12000\ r^2}\right)$

For pins at both ends, $16000 \div \left(1 + \frac{L^2}{9000\ r^2}\right)$

where "L" is the length of the member in inches and "r" is the least radius of gyration in inches.

Bending, on extreme fibres of rolled shapes, built sections, and girders, net section	16,000
Shearing, shop driven rivets in reamed or drilled holes	10,000
Power driven field rivets in reamed or drilled holes	9,000
All other field rivets	8,000
Lathe turned bolts in reamed or drilled holes	8,000

Webs of girders, gross area	10,000
Bearing on diameter of rivets, twice the shearing value given above.	
Bearing on pins	22,000

Rivets

In proportioning rivets the nominal diameter of the rivet shall be used.

In proportioning tension members the diameter of the rivet holes shall be taken one-eighth of an inch larger than the nominal diameter of the rivet.

Unsupported lengths

No compression member shall have a length exceeding forty-five (45) times its least width, nor an unsupported length in any direction exceeding one hundred (100) times its least radius of gyration about an axis perpendicular to that direction, excepting wind bracing and lateral struts, which may have an unsupported length of one hundred and twenty (120) times the least radius of gyration.

Details of Design.

Water pockets

Pockets which would hold water shall have drain holes or be filled with waterproof material, as the Engineer may direct.

Diameter of Rivets

The diameter of the rivets before upsetting shall be in general seven-eighths of an inch; smaller rivets being used only when noted on the drawings or specially permitted or ordered by the Engineer. Field rivets larger than seven-eighths of an inch in diameter will not be allowed.

Minimum and Maximum pitch

The minimum distance between centres of rivet holes shall be preferably not less than 3 inches for $\frac{7}{8}$-inch rivets. The maximum pitch in the line of strain for members composed of plates and shapes, shall be 6 inches for $\frac{7}{8}$-inch rivets, and 5 inches for $\frac{3}{4}$-inch rivets. For angles with two gauge lines and rivets staggered, the maximum shall be twice the above in each line. In tension members composed of two angles in contact, a pitch of twelve inches will be allowed for riveting the angles together.

Pitch at ends

The pitch of rivets at each end of built compression members shall not exceed four diameters of the rivets for a length equal to twice the depth or width of the member.

Rivet pitch in plate girders

The pitch of rivets connecting the flanges to the web shall not be less than that given by the formula $p = \frac{r\,h}{s}$ where "p" is the rivet pitch, "r" the value of one rivet, "h" the effective depth of the girder, and "s" the shear at the point in question.

All stiffeners which carry load shall have sufficient rivets for that purpose and all other stiffeners shall have rivet spacing not to exceed five inches.

Edge distance

The minimum distance from the centre of any rivet hole to a sheared edge shall be $1\frac{1}{2}$

inches for 7/8-inch rivets, and 1¼ inches for ¾-inch rivets; and to a rolled edge 1¼ and 1⅛ inches respectively. The maximum distance from any edge shall be eight times the thickness of the plate, but shall not exceed 6 inches.

Long rivets

Rivets carrying calculated strain and whose grip exceeds four diameters, shall be increased in number at least one per cent. for each additional 1/16-inch of grip.

Minimum thickness of material

The minimum thickness of metal shall be ⅜-inch, except in case of fillers.

Strength of joints

The design throughout shall be such that failure will occur in the body of a member rather than in any of its details or connections.

In members subject to reversal of stress, the connections shall be designed to take the greater stress, plus fifty per cent. of the smaller.

Where splice plates are not in direct contact with the parts which they connect, rivets shall be used on each side of the joint in excess of the number theoretically required, to the extent of one-third of the number for each intervening plate.

Rivets carrying stress and passing through fillers shall be increased fifty per cent. in number; and the excess rivets, when possible, shall be outside of the connected member.

Eccentricity in riveted connections shall be avoided as far as possible, and where unavoidable, sufficient additional rivets shall be used to provide for the stresses caused by the eccentricity.

Facing

Abutting ends shall be dressed true and brought into close contact, as specified under "Workmanship," and all material shall be ordered to sufficient dimensions to permit of the required finishing.

End connections

The end-connection angles of floor beams and stringers must be one-half inch (½") thick before facing.

Single angle connections

Single angles in tension must be connected by both legs, or else the section of one leg only will be considered effective.

Re-entrant cuts

No re-entrant cuts with sharp angles or rough or ragged edges, will be permitted. The corner shall be filletted and the edges of the cut dressed smooth.

Tie plates and lacing

Tie plates and lacing shall be furnished where required. When not shown on the drawings, the sizes of material and arrangement of details shall be in accordance with the best practice.

Universal mill plates

Universal Mill Plates are to be used wherever possible. Wherever a plate with a sheared edge is subject to tension, the material shall be removed to a depth of at least one-quarter of an inch from the sheared edges.

Contractors' Drawings, Etc.

Size of drawings

The contractor's drawings shall have, as far as possible, the same dimensions and border ruling as the City's drawings Nos. 101, etc., to admit of convenient binding and filing.

Approval required

The contractor's working drawings shall be subject to the approval of the Ontario Railway and Municipal Board and the Engineer, and the contractor shall make all changes in details necessary to secure such approval without entitling him to additional compensation. For these purposes the contractor shall furnish the Engineer with as many prints of each drawing as may be required. After approval by the Ontario Railway and Municipal Board and the Engineer, one print of each shall be returned by the latter to the contractor.

Preliminary drawings

In order to facilitate the preparation and approval of plans, the contractor shall confer with the Engineer from time to time in connection with his paper drawings and layouts of details. Provisional approval of these, however, shall be regarded merely as a convenience to the contractor and shall not affect the right of the Engineer to make changes in details before final approval.

Ordering material

No material shall be ordered until the working drawings for the same have been finally approved.

Copies to be furnished the City

The contractor shall promptly furnish the City, free of charge, with as many copies of working drawings, mill orders, shop bills, shipping bills, etc., as may be required.

Material.

Am. Soc. for testing materials

The material shall conform to the requirements set forth in the standard specifications for structural steel for bridges, published by the American Society for Testing Materials, in their year book for 1913, hereby made part of these specifications, with the following additions:—

Rolled plates, shapes and bars

Test specimens for plates, shapes and bars must, after being heated to a red heat and cooled in water at 75 degs. Fahr., bend 180 degs. around a circle whose diameter is equal to the thickness of the test piece, without sign of cracking.

Punched holes, pitched two diameters from a sheared edge, shall stand cold drifting till they are expanded to one and one-half times their original diameter without cracking the sides of the metal.

Rivets

Rivet rods or finished rivets when heated to a cherry red and cooled in water at 75 degs. Fahr., shall bend double to close contact without cracking.

Rivet rods or finished rivets when nicked and bent around a bar of the same diameter as the rivet rod, shall give a gradual break and a fine, silky, uniform fracture.

Pins

Pins shall be forged. Blooms for pins shall have at least three times the area of the bar forged from them.

Steel castings

Steel castings shall be made only at such foundries as the Engineer may consider fully equipped for doing the best class of work.

Steel castings shall meet the requirements for Class B soft.

Castings, when offered for inspection, shall not be covered with paint, rust, or any other substance which will tend to hide defects.

Rejection by melts

Rejection based on any of the above tests or analyses, shall apply to the whole melt represented by such test piece.

Mill inspection and testing

(*a*) No material shall be rolled nor work done before the Engineer has received sufficient notice where the orders have been placed, so that inspection may be arranged for.

(*b*) The Inspector representing the City shall have free entry at all times while work on this contract is being performed to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The manufacturer shall furnish the Inspector, free of cost to the City, with suitable apparatus, assistance, and facilities for making at the works prior to shipment, the tests outlined above (except check analyses), and for otherwise satisfying himself that the material is being furnished in accordance with these specifications, both as regards quality and weight.

All test specimens shall be selected by the Inspector and shall be furnished by the manufacturer, free of cost to the City.

Workmanship.

First-class workmanship

Workmanship throughout shall be first-class and in accordance with the best modern practice for bridges of similar importance, attention being called particularly to the following:—

Straightening

All material is to be straightened in the shop before being laid off or worked in any way, by methods approved by the Engineer.

Any material damaged in transit must be rejected when such damage consists of sharp kinks or any other injury which, in the opinion of the Engineer, might render it unfit for use in the bridge.

In no case is material to be heated for the purpose of straightening.

Members, and the several pieces when formed into one member, shall be straight and free from twists. There shall be no open spaces between parts which are intended to be close together.

The straightening of a built member will not be permitted after it has been riveted together, but it must be taken apart and each part straightened separately.

Finish

Shearing shall be neatly and accurately done and all portions of the work neatly finished.

Holes

Rivet holes in secondary parts such as lateral bracing, need not be reamed, but may be punched one-sixteenth (1/16) of an inch larger than the nominal diameter of the rivet. This may also be done in certain minor members not carrying calculated stress, subject, however, to the approval of the Engineer.

In special cases, as noted on the drawings and in flanges of channels or I beams, the holes shall be drilled from the solid to an iron template.

Except as specified above all holes shall be punched one-eighth of an inch smaller than the nominal diameter of the rivet and reamed out to one-sixteenth of an inch larger than the same.

The die shall not exceed the diameter of the punch by more than one-sixteenth (1/16) of an inch, and all holes must be cleanly cut by the punch without torn or ragged edges.

After punching, the holes must match so that at least one-thirty-second of an inch of material shall be removed by reaming from all parts of the circumference of each hole on the die side. Poor matching of holes will be cause for rejection.

All reaming shall be done with twist drills in substantial drilling machines working without vibration and in such a manner as to insure a hole perfectly cylindrical and perpendicular to the plane of the metal.

Sharp edges and burrs shall be cut off with a countersinking tool and a fillet of about one-sixteenth (1/16) of an inch made under each rivet head.

Holes for field connections of stringers and floorbeams shall be reamed or drilled from the solid to approved iron templates.

The pieces forming one built member shall be assembled and firmly bolted together before reaming.

In the case of all field connections, except those for stringers, floorbeams and lateral bracing, the members shall be assembled and bolted firmly together before reaming. Each half arch rib shall be completely assembled in this way, and the centres of crown and abutment pins carefully checked before reaming any of the holes in the joints.

After reaming assembled connections and before taking the members apart, it will be necessary to match-mark the pieces so that they may be re-assembled in the same position in the final setting up, when no interchange of reamed parts will be allowed.

The system of match-marking shall be subject to the approval of the Engineer and shall be such that the marks will be plainly visible after erection.

Rivet holes must be laid off accurately before punching. In cases where reaming is not required the holes must match with sufficient accuracy that the cold rivet can be inserted readily.

Drifting to enlarge unfair holes will not be allowed. If the holes must be enlarged to admit the rivet they shall be reamed and a larger rivet used.

Poor matching of holes will be cause for rejection.

Rivets

Shop and field rivets shall be driven by direct acting machinery wherever possible. In cases where this cannot be done pneumatic hammers shall be used in preference to hand driving. While rivets are being driven the parts shall be held together tightly.

Rivets shall look neat, and be finished with heads of approved shape, full and of equal size. They shall be central on shank and grip the assembled pieces firmly.

Recupping and calking will not be allowed. Rivets which are loose, burned, or otherwise defective, shall immediately be removed and replaced by satisfactory rivets.

In removing rivets great care shall be taken to do so in such a way as not to injure the adjacent metal. If considered necessary by the Inspector, they shall be drilled out.

Turned bolts

Wherever bolts are used in the place of rivets to transmit shear, the holes shall be reamed parallel and the bolts shall have their turned part long enough to extend through the metal, and machine fitted to fill the holes with a driving fit. A washer not less than one-quarter of an inch thick shall be used under each nut.

Facing

At connections or splices all abutting ends shall be accurately faced to the correct angle with the axes of the members and shall be in close contact when rivetted up.

The ends of all floorbeams and stringers shall be faced true and to exact length, so as to take a cut off all main material as well as off connection angles.

Connection angles for floorbeams and stringers must be one-half inch (½″) in thickness before facing, and not less than seven-sixteenths (7/16) of an inch in thickness after facing. The necessity for removing more than one-sixteenth (1/16) of an inch from their thickness shall be cause for rejection.

Clearing fillets

Corners of material must be carefully trimmed to clear fillets. Attention is called particularly to the upper corners of stringers.

Webs of girders

In plate girders without cover plates the webs shall be flush with the top flange angles and shall not come more than one-quarter of an inch inside of the bottom flange angles.

In plate girders with cover plates, neither top nor bottom edges shall fall inside of the flange angles more than one-quarter of an inch.

Pins

Pins shall be turned straight and smooth to a gauge so as to come into even contact all over their bearings.

Pin bearings

All bearings for pins must be bored exactly perpendicular to the central planes of the arch ribs. They shall be bored with a sharp tool and a finishing cut shall always be made. The finished hole shall be true and perfectly smooth.

Machining of castings

All bearing surfaces of castings shall be accurately machine finished, as shown on drawings, so that after erection, all bearings shall be true and even.

Order of operations

The shoes shall be finished and bolted to the steelwork in correct position after the latter has been faced. Each half rib shall then be assembled for reaming.

The distance, centre to centre of bearings, shall then be carefully checked before any reaming is done and before the crown bearing is bored. In checking this distance allowance for temperature shall be made as the Engineer may direct.

Stiffeners

Fillers the full thickness of flange angles shall be used under all stiffeners.

Ends of stiffeners shall be made to fit the flanges as closely as possible without buckling the latter. Where the stiffeners carry load as a column, their ends shall be faced and shall have a full bearing with the flange angles.

Rejected material

Material rejected at the contractor's works shall be plainly marked by the Inspector and all rejected material shall be at once removed from those portions of the premises where work is being done on this contract.

Painting.

Number of coats

Except as hereinafter provided, all surfaces of steelwork shall have three coats of paint, referred to as shop coat, first field coat, and second field coat.

Shop painting

All steelwork shall, before receiving the shop coat, be thoroughly cleaned in such a manner as the Engineer may require, so as to remove all loose scale, rust, oil, and all other foreign substance.

All material shall, before leaving the shop, receive a shop coat. In shop rivetted work, surfaces coming in contact shall each receive a good shop coat before being rivetted together. The balance of the shop painting shall be done after rivetting and care shall be taken to work the paint well into all joints. After shop painting the metal shall remain under cover until thoroughly dry.

Parts which will be inaccessible when in place shall receive prior to erection, the two field coats; the first of which may be applied at the shop if so desired.

Field painting

All dirt shall be removed, and places where paint has been scraped off shall be re-painted with the same paint as used in the shop coat. Heads of field rivets shall be painted with the same paint as soon as practicable after being driven.

After the steelwork has been erected it shall receive the first and second field coats.

Metal dry free from frost

In no case shall painting be done when the metal is wet, contains frost, or when exposed to freezing or damp weather.

Thinning

If it is necessary in cool weather to thin the paint in order that it shall spread more freely, this shall be done only by heating and only when and as authorized by the Engineer.

Application

Paint when applied shall be thoroughly brushed and worked in such a manner as to produce a uniform coating in close contact with the metal or with previously applied paint. Care shall be taken to work the paint into all joints, crevices and open places.

All small cavities which have not become sealed in a watertight manner by the first field coat shall be filled with a mixture of red lead and linseed oil in paste form, before the second field coat is applied. This paste shall consist of a finely ground high grade red lead, mixed in pure linseed oil in the presence of the Inspector immediately before use.

All painting must be done in a neat and workmanlike manner.

Removing improper paint

All metal coated with impure or unauthorized paint shall be thoroughly cleaned and re-painted to the satisfaction of the Engineer, at the sole expense of the contractor.

Successive coats

In no case shall a second or third coat be applied until the preceding one is sufficiently dry; this to be determined in all cases by the Engineer.

Kind and color of paint

The paint to be used in each coat shall be determined by the Engineer, and shall be either a regular brand or specially made to the Engineer's specification, as he shall decide.

Machine finished surfaces

Machine finished surfaces shall be coated with white lead and tallow before shipment or before being put out into the open air.

Stencilling

At such places as may be designated by the Engineer, the contractor shall stencil on the last coat the name of paint used in each coat and the name of month and year.

City to furnish paint

The City is to furnish all the paint, but the work of preparing the surface of the metal and applying the paint shall be included in this contract.

Erection.

Dressing granite bearings

The contractor shall carefully check the distance between adjacent piers, locate the pin centres, and dress the granite bearing blocks to correct surface.

Drilling holes and setting anchor bolts

The erection of the steelwork shall include drilling holes for all anchor bolts and setting the same in a grout of neat portland cement.

Sheet lead

Sheet lead ⅛-inch thick, shall be furnished by the contractor and placed under the bearings of all the steel arches, the bases of all steel columns, and the bearings of trusses.

Adjustment of arch ribs during erection

Provision shall be made for raising or lowering the arch ribs during erection if necessary, to permit adjustment.

Matching of lower chords at crown

The latticed struts (between the lower chords of the inner ribs) at the crown shall be made ¾-inch short out to out of end angles, and fillers of suitable thickness shall be selected to line up the bottom chords correctly. The angles in the vertical bracing connecting to the end gussets of these struts shall have the holes in the lower ends drilled in the field so as to insure tight bracing when they are rivetted to the same.

Injury to material

Material shall be so handled as to avoid injury and shall be placed on suitable skids, well above the ground, until needed for erection.

No member slightly bent or twisted shall be put in place until straightened. All members that, in the opinion of the Engineer, have been seriously damaged in handilng, shall be rejected; and the Engineer's decision shall be final.

Defective material on work

Failure to reject inferior material or workmanship before the completion of the structure shall not deprive the Engineer of the right to reject the parts affected prior to the expiration of the period of guaranteed maintenance. All such defective parts shall be removed and replaced by others which shall conform to the spirit of the specifications; the same to be done by the contractor at his own expense.

Dispossition of rejected material

Portions of the steelwork which have been rejected in the field shall be plainly marked and the Engineer shall take such precautions as he may deem necessary to prevent their use in any other part of the work.

Repairing damage

The contractor shall make good to the satisfaction of the Engineer, all damage done to other portions of the work.

Clearing site

The contractor shall remove all his falsework, plant, and surplus materials, as well as any rubbish accumulated on account of his operations, and shall leave the site in a neat and tidy condition.

PILING.

The contractor shall, on the order of the Engineer, furnish plant, materials and labor in connection with any piling required, whether wooden or concrete.

All piling shall be paid for at the rate of cost plus fifteen per cent. (15%).

GENERAL CONDITIONS.

Definition of contract

1. The work required to be done by the contractor under this contract comprises all requisite excavations, and the removal of all materials and obstructions in any way required for the proper carrying out of the works; the formation, construction, completion and maintenance of the several works referred to in the Plans and Specifications relating thereto, and in these General Conditions. The several parts of the Plans, Specifications, these General Conditions, and the Contract shall be taken together to explain each other, and to make the whole consistent; and if it be found that anything has been omitted or misstated, which is clearly necessary for the proper performance and completion of any part of the work contemplated, the contractor will, at his own expense, and without making any extra claim therefor, execute the same as if it had been properly described, and the decision of the Engineer in regard thereto shall be final, and the correction of any such omission or misstatement shall not be deemed to be an addition to, or deviation from, the works hereby contracted for; nor shall such decision or correction entitle the contractor to an extension of time for the completion of the contract.

Plant, labor and material

2. The contractor is to provide all necessary storage ground, and furnish all required labor and materials, fuel, machinery, tools, implements, scows, boats, tugs, or other plant, also all workmanship, men, animals and teams, pumps, engines or other appliances, together with all proper and required facilities for moving and transporting the same, so that the contract, and all work required to be done under it, can and will be carried on in a workmanlike manner, properly, satisfactorily, continuously, and expeditiously, to completion, in all respects to the Engineer's satisfaction. The plant and all approved materials provided by the contractor, in all cases, from the time at which they or any of them are brought upon the works, or upon the streets or lands of the City, for the purposes of the contract, and until the completion of the works, shall become and continue to be, the property of the Corporation, and the contractor is prohibited from removing the same, or any part thereof, during the progress of the works, without the consent or instructions of the Engineer in writing; but no advance of money will be made to the contractor on plant or materials delivered unless specially provided for herein.

Samples

3. Before any material of any kind is used in the work, the contractor must submit samples thereof for the approval of the Engineer, and no material shall be used which is in any way inferior to the approved sample; but it is understood that the approval of any material shall not subject the Corporation to pay for the same, nor prevent the rejection afterwards of any portion thereof which may turn out to be unsound or unfit to be used, in the Engineer's judgment; nor shall such approval be considered as any waiver of objection to the work at any subsequent period, on account of the unsoundness or imperfection of the materials used, or on any other account.

Condemned and surplus materials

4. Should any plant, appliances, materials or workmanship which the Engineer may deem to be inferior or unfit for use in or on the works, be brought on the ground, or used, the same shall be wholly removed therefrom within 24 hours after notification to that effect from

the Engineer, and in case of failure or neglect on the part of the contractor to remove the same, the Engineer may cause the same to be taken away, at the contractor's expense, and deposited, wasted or otherwise disposed of, in any locality, place or way he considers convenient or proper, and the contractor shall forthwith pay to the Corporation, on demand, all expenses incurred. The contractor will not be allowed to pile any of the excavated material upon the sides of the street except by the Engineer's written permission. All surplus materials, not required by the Corporation, must be disposed of by the contractors off the line of the works, but in such a manner as not to cause a nuisance, injury or inconvenience to the Corporation or to public or private parties; otherwise the contractor will, in all cases, be held liable for, and must indemnify the Corporation against, all claims in respect thereof.

Defective work

5. The contractor shall, at any time, when so required by the Engineer, during construction or during the period of guaranteed maintenance, remove such portions of the structure as the Engineer may direct, which he shall forthwith make good again to the satisfaction of the said Engineer. Should the portion so removed be found, in the opinion of the Engineer, faulty in any respect, the whole of the expenses incurred shall be defrayed by the contractor; but if the portion so removed be found in perfect condition, the said expenses shall be borne by the Corporation. All defective work or materials discovered by this or any other means must be forthwith wholly removed, and made good by the contractor, to the Engineer's satisfaction, and the whole cost of such renewal, including the cost of materials, labor and inspection, shall be defrayed by the contractor. Should the contractor refuse to make such renewals as are ordered by the Engineer, then shall the Engineer proceed with the work in any manner he may deem fit, or as provided in section 34, the cost of such work to be paid by the contractor, or collected by the Corporation as provided in section 38 hereof.

Drainage

6. The contractor shall keep all portions of his work well, properly and efficiently drained during construction and until completion, and he will be held responsible for all damage which may be caused or result from water backing up or flowing over, through, from or along any part of the works, or which any of his operations may cause to flow elsewhere.

Barriers and lights

7. The contractor must, at his own expense, and without further or other order, provide, erect and maintain all requisite barriers, fences or other proper protection, and must provide, keep and maintain such watchmen and lights with red globes as may be necessary or as may be ordered by the Engineer, in order to insure safety to the public as well as to those engaged about the premises or works; and must (where it is practicable, in the Engineer's opinion) keep any roadway open for travel for the use of the public, for such width as the Engineer may direct. He must also provide a sufficient number of "NO THOROUGHFARE" or other proper notices, which he must cause to be placed and maintained in good order in conspicuous places wherever any roadway, sidewalk, thoroughfare or place is torn up or dangerous, and so long as it remains unsafe or unfinished. When any work is carried on at night, the contractor must supply, at his own expense, a sufficient number of electric or other approved and efficient lights, to enable the same to be done in an efficient and satisfactory manner, and the Engineer shall have the power to order additional lights to be put on at the contractor's expense, if, in the Engineer's opinion, they are or may be required.

Use of hydrants and water

8. Contractors will be allowed to obtain water from the fire hydrants, provided they supply themselves with a reducer and small valve, which must be operated for this purpose. This small valve must be maintained in perfect working order the whole time the work is under construction. If at any time during the construction of the work the inspector finds that the small valve is out of order, and cannot be operated so as to turn the water on and off, he must immediately close the hydrant valve, and keep it closed until the small valve has been repaired or a new valve in good order substituted. The inspector will open up the main valve of the hydrant in the morning and close it at night. On no account will the contractor or his employees be allowed to open and shut the hydrant valve. Any infringement of this rule will render the contractor liable to summons in the Police Court for opening the hydrant without leave.

The contractor shall at all times keep all hydrants, water-valves, stop-cocks, street gullies and man-holes free and easy of access, so that they can be conveniently got at by the fire department or other authorized persons. Where the contractor desires to use water from a Corporation hydrant, he must first obtain a written permit from the Engineer, and provide himself with a proper key, and any hydrant found injured on the line of the works, after the works have been commenced, will be made good by the Corporation at the contractor's expense.

Water for construction will be furnished by the Corporation when required at the rate of ten and one-half (10½) cents per thousand (1,000) gallons.

The basis of computation, when not by meter measurement, shall be as follows:—For concrete in place, 20 gallons per cubic yard, and for boilers used in connection with pile drivers, steam shovels, concrete mixers, hoisting engines, etc., 150 gallons each per day from date of installation to date of removal.

Conveniences

9. The contractor must provide, and properly maintain in clean condition, suitable and convenient privy or water closet accommodation for his men, so that no source of inconvenience, complaint or nuisance shall result to the public or to residents or others in the vicinity of the works.

From the first of November to the first of April, the contractor shall provide, at his own expense, an adequate, warm, comfortable shelter, accessible during the noon hour and inclement weather, to all the men employed on the work, and its location shall be approved by the City Engineer.

Public convenience

10. In carrying out the work, or any portion thereof, the convenience and safety of the public must always be specially considered and provided for by the contractor, who must not obstruct any street, thoroughfare or foot-walk, longer or to any greater extent than is absolutely necessary in the Engineer's opinion, and shall in no case tear up or open more of any

street, roadway or place than is ordered or sanctioned by the Engineer in writing. The contractor is to provide perfectly safe, ample and convenient means of approach and entrance to adjoining lanes, driveways, buildings and property, both for vehicles and foot passengers, wherever necessary, and for passing along all roadways and foot-walks, and for crossing the same where it is practicable to do so, both during the prosecution of the works as well as other times, and for this purpose must construct and maintain, in good and serviceable condition, suitable and convenient platforms, approaches, structures, bridges, crossings or other works. He shall not deposit any material upon any street, sidewalk, boulevard, grass plot or other Corporation or public property, without the Engineer's permission, nor shall he obstruct street crossings, but shall leave a free passage at least twenty feet (20 ft. wide).

Patents

11. The contractor shall fully indemnify the Corporation against and from all suits or actions arising from the claim of any person or persons who are, or claim to be, patentees of any process used in connection with the work, or of any material, plant, machinery, tool or appliance used therein or thereon, or in any way therewith.

Assistance

12. The contractor is to furnish the Engineer, or any of his assistants, with any reasonable help which he or they may require at any time, in driving stakes or in setting out the work. He shall also furnish the said parties, or any of the Inspectors, at all times, with convenient means of access to all parts of the works, and also with all required assistance, to facilitate thorough examination of the same, and inspection, culling and removal of doubtful or defective material, and for any other purpose required in connection with the said works or in the discharge of their respective duties, for which service no additional allowance will be made.

Stakes, lines and levels

13. The contractor shall, before commencing his working drawings, compare all dimensions given on the City's drawings and report to the Engineer any inconsistencies in the same; after the adjustment of which the contractor shall be wholly responsible for the completion of the structure in conformity with the lines, grades and clearances as set forth in these specifications and drawings.

To assist the contractor in obtaining line and level a set of permanent monuments has been installed at the locations and elevations shown on drawing No. 29. The contractor shall be responsible for the proper preservation of these monuments.

The Engineer's representative will, when requested by the contractor, assist him by checking measurements of line or level made by the latter.

Errors by contractor

14. Changes, errors or mistakes made by the contractor or his agents, workmen or employees, either through carelessness or otherwise, and all settlements, failures, wash-outs and defects must be rectified by the contractor, at his own expense.

Omissions

15. Anything whatever which may be imperfectly specified or imperfectly shown on the plans, or shown on the plans and not specified, or which may be specified and not shown, must be taken, considered and done as if it were both shown and specified.

Verbal arrangements

16. In all cases of misunderstandings and disputes, verbal arrangements will not be considered, but the contractor must produce written authority, in support of his contentions, and shall advance no claim in the absence of such written authority, or use, or attempt to use, any conversation with any parties against the Corporation, or in prosecuting any claim against the Corporation.

Suspension of work

17. Unless otherwise directed, in writing, by the Engineer, all masonry, concrete, painting, roadway and pavement work, and all work liable to be injuriously affected by frost, or which cannot, in the Engineer's opinion, be satisfactorily proceeded with because of the condition of the weather, must be put in proper and satisfactory condition, carefully and well protected where necessary, and as and where directed. The Engineer may, by an order in writing, at any time stop or suspend any part of the work, or direct any portion to be commenced or completed in priority to any other part or portion, or may cancel the order to proceed with the work, or with any part thereof, and the contractor shall not thereby be entitled to any additional payment, or to any claim for loss of profit, or anticipated profit, or for damages or otherwise, howsoever, by reason of such order. When, in the opinion of the Engineer, for any reason it is deemed advisable to discontinue the work, or any part thereof, for the winter, the contractor must, on notice from the Engineer, forthwith place the work in proper and satisfactory condition for the accommodation of the public during the winter season, and for its effectual protection against damage from rain, snow, frost, ice or other causes, and must so maintain it. When work is permitted by the Engineer to be done during freezing weather, the contractor shall provide the necessary means for heating, and shall heat the bricks, broken stone, gravel, sand and water or other material, and shall comply with all requirements of the Engineer to thoroughly protect the work from damage by frost during and after execution; all at the cost and expense of the contractor.

Damage

18. In carrying out the works from their inception, and until the final acceptance of the same, the contractor must be careful to cause as little injury or damage as possible to any adjacent property, public or private, or to any sidewalks, roadways, curbs, gutters, man-holes, frames, covers or street gullies, boulevards, grass plots, sodding, trees, shrubs or any other structures, works or things on or near the line, or in the vicinity of the works or elsewhere, and he must make good the same, at his own expense, in the manner directed by, and to the satisfaction of, the Engineer.

Engineer sole judge

19. Should any discrepancies appear, or differences of opinion, or misunderstanding, arise, as to the meaning of the Contract or of the General Conditions, Specifications or Plans, or as to any omissions therefrom, or misstatements therein, in any respect, or as to the quality or dimensions, or sufficiency of the materials, plant or work, or any part thereof, or as to the due and proper execution of the works, or as to the measurement or quantity or valuation of any works executed, or to be executed under the contract, or as to extras thereupon, or deductions therefrom, or as to any other questions or matters arising out of the contract, the same

shall be determined by the Engineer, who shall have the right at all reasonable times to visit, enter and inspect any buildings, factories, workshops, works or sites of the contractor or others wherever any materials are being prepared, manufactured or treated, or other work is being done in connection with this contract; and his decision shall be final and binding upon all parties concerned, and from it there shall be no appeal; and the contractor shall immediately, when ordered by the Engineer, proceed with and execute the work or works, or any part thereof, forthwith, according to such decision, and with such additions to or deductions from the contract price as are provided under the terms of the Specifications, Contract and General Conditions, without making any claim for any extension of time in completing the contract, unless arranged in writing with the Engineer, as herein provided.

Guaranteed Maintenance

20. The contractor guarantees that with ordinary wear and tear the said work shall, for a period of 60 months from the date of the completion thereof, remain in such condition as will meet with the approval of the City Engineer, and that he will, upon being required by the City Engineer, make good in a permanent manner, satisfactory to the City Engineer, any imperfections therein due to materials or workmanship used in the construction thereof. The decision of the City Engineer is to be final as to the nature and cause of such imperfections and the necessity for remedying the same. Should the contractor fail to comply with the directions of the City Engineer, the latter may, after giving the contractor twelve hours' written notice, perform the necessary work, and the cost thereof may be deducted or collected by the Corporation, as provided in section 38 hereof.

Commencement, completion and penalty

21. The works shall not be commenced, or any material procured, until the contractor has obtained or received a written order to commence the same, signed by the Engineer, and they shall thereupon be at once begun and continuously carried on to completion (subject as herein provided), and shall be completed, and full possession thereof given the Corporation by the date or time herein provided, unless a longer period shall be allowed, in writing, by the Engineer, in which case it shall be carried on to completion, and full possession given to the Corporation within the additional time so allowed, and the contractor is to finish each of the works awarded to him within the period, or by the date marked opposite the same in the following list, or, in case extra time is allowed by the Engineer, by the date fixed by the Engineer, as aforesaid, counting from the date of the Engineer's order to commence the same and is (in addition to Inspector's wages) to pay such amounts marked opposite each as liquidated damages for every day that the said work shall remain unfinished after that time. But in the event of delay caused by strikes or combinations on the part of the workmen employed, or by any act of the Council of the City, or from such other cause as, in the Engineer's opinion, the contractor cannot reasonably be held responsible for, or in the event of extra or additional work being ordered by the Engineer, the Engineer may allow such additional time for completion as he may deem fair and reasonable, providing the contractor applies in writing for an extension of time at the time such delay occurs, or such extra or additional work is ordered, and satisfies the Engineer that he is justly entitled to a further time allowance.

NAME AND NATURE OF WORK	Time within which the work is to be completed from date of order to commence, including Sundays and holidays.	Daily penalty for non-completion in time.	Daily bonus for completion in advance of specified time.
1. Foundations and footings of piers, abutments, walls, and pedestals complete.....	15 months.	$100.00	$25.00
2. Pedestals and cross walls completed, abutments and longtiudinal walls of approaches carried up to floor and sidewalk slab, and piers up to top of lower deck portion, all to be ready for erection of steelwork.....	24 months.	100.00	25.00
3. Structural steelwork erected	32 months.	100.00	25.00
4. Balance of concrete and waterproofing finished and contract completed.....	36 months.	100.00	25.00

No progress or interim estimate or certificate shall release the contractor or his sureties from any responsibility, or be taken as evidence of any such release, or as an acceptance of any work or material, or as a waiver of any condition herein. The whole work and every portion and detail thereof shall, at the time of completion, be put and left by the contractor in good and satisfactory condition, finished in all respects, and at the time, must be fully up to the requirements of the specifications in every particular; all surplus and refuse material and rubbish removed from the vicinity of the works; the premises left in a neat and tidy condition; all damages to adjacent property, pavements, foot-walks, boulevards and sodding, or other things, injured or interfered with by the contractor or his men, made good; all wages paid, and every other requirement of the contract complied with. No work or contract shall be deemed to be completed until the delivery to the City Engineer of a certificate to the above effect (on a form to be supplied by the Engineer, and to be known as "Completion Certificate for Payment") properly dated and signed by the contractor, which certificate will be endorsed by the Engineer as soon as he is satisfied the work has been satisfactorily completed, and the term of guaranteed maintenance shall be computed from and commence on the date of completion, as shown on the final report of the Inspector. The contractor must submit this certificate (in duplicate) to the Engineer as soon as he considers the work completed. In case of the contractor's failure to finish the work or works properly and fully, and as required, or in case of the work, or any part thereof, being taken out of his hands, as provided in these Conditions, the Engineer may proceed to finish the work for him as his agent in this respect, and at his expense, or proceed, as provided in section 34, and may require any Corporation foreman, inspector or other reliable person, to fill in and sign another certificate to the same effect, and the certificate so given shall have the same effect as if the same had been signed by the said contractor, and the date of completion shall be the date of such last-mentioned certificate. The contractor shall give the Engineer at least 36 hours' notice in writing before commencing work on any portion of the contract, or at any new point or place, as well as at any

point or place where work has been relinquished, suspended or stopped from any cause; and any work done contrary to the provisions of this clause must be opened up for thorough examination, or entirely taken up and re-built, whenever so directed by the Engineer.

Sureties and bond

22. The contractor, together with two sureties (approved of by the City Treasurer), not members of the City Council, or Officers of the Corporation of the City of Toronto, or in lieu of said two sureties, a guarantee company, approved as aforesaid, will be required to enter into a bond for the sum or sums hereinafter named, and in a form approved by the City Solicitor, or the contractor may deposit with the City Treasurer a sum in cash to the like amount, for the due and proper performance of the contract. Each surety will be required to make a statutory declaration before a Justice of the Peace, or Commissioner for taking affidavits, that he is worth the amount of the bond hereunder written, over and above a sum sufficient to pay all his debts and liabilities. The expense of preparing the contract and bond is to be paid by the Corporation, but the expense of getting the same executed, if any, is to be borne by the contractor.

The amount of the bond required for the proper performance of this contract is the full amount of the lump sum bid, and this bond is to continue in force until the expiration of the period of guaranteed maintenance.

Alterations, extras, deductions and claims

23. The Engineer shall have the right to make or order any alterations and changes, such as he may deem advisable, at any time before or during the prosecution of the works, in any line, grade, plan or detail thereof, or to suspend or omit any portion of the work, or to increase or decrease the dimensions, quantity of material or work, or to alter the situation or level, or to vary the form or dimensions of any part of the work or works, or to vary in any other way the work herein contracted for; or to order any additional or extra work to be done, or additional or extra materials to be furnished; and the contractor shall, in pursuance of the Engineer's written orders to that effect, proceed with, carry out and execute the works as directed, and shall supply such additional materials, and do such additional or extra work, in pursuance of such orders, without being entitled to any extension of time for completion, or any additional payment on account thereof, except only as herein provided. In each and every case where additional or extra work or material of any kind is ordered to be done or supplied, or where the contractor does or supplies, or contemplates doing or supplying any work or material which he considers extra or beyond the requirements of the contract, or upon which he intends claiming any extra or additional payment, he is required, before commencing any such work, or procuring any such material, to obtain from the Engineer a written order therefor, stating that the same is an extra and will be paid for as such, and also clearly defining the nature of such extra work or material, and the amount the contractor is to receive therefor, or the terms under which the same is to be paid for; and the contractor shall also, before beginning any such extra work or commencing to deliver any such additional material, notify the Engineer, in writing, of his intention to commence work thereon or delivery thereof, so that a proper account or record of the same may be kept by the Engineer. In case of the contractor's neglect or failure to observe fully and faithfully the above conditions, he shall forfeit all right to payment therefor, which he otherwise might have had, and shall not make any claim

in respect thereof, and if made, the City may reject the same as invalid, and he shall not have any right of recovery in respect thereof, at law or otherwise, unless he shall have obtained the Engineer's consent in writing to his making such claim. Any extra work ordered by the Engineer to be done by day's work shall be done by the contractor, who shall be paid (subject in all respects to the above conditions and provisions) therefor only the actual cost thereof, including a reasonable proportion of wages of timekeeper and superintendent, as determined by the Engineer's estimation, plus 15 per cent. thereon for use of plant, tools, etc., and to cover contractor's profits, and the contractor must furnish the Engineer with satisfactory vouchers for all labor and material expended on the work. Nothing herein contained is to preclude the Corporation or the Engineer from having any extra or additional or other work done by the Corporation workmen or other parties, in the event of satisfactory arrangements therefor not having been concluded between the Engineer and the contractor, or for any other sufficient reason, in the Engineer's opinion. In the event of any circumstances arising at any time which, in the contractor's opinion, would entitle him to additional compensation, and which are not fully provided for herein, he shall at once, on the discovery of such circumstances, notify the Engineer in writing, and shall state in his notification clearly and fully what the circumstances are, and the additional sum or compensation he intends to demand therefor, otherwise he shall have no claim in respect thereof. If any work, labor or material which the contractor was required to perform or supply under these specifications, is directed by the Engineer to be changed or omitted, whereby a less quantity of work, labor or material is performed or supplied, then the City Engineer may deduct from the contract price the value of any work, labor or material not required to be performed or supplied, ascertained in accordance with the schedule set out in the tender for the work. All claims of every nature, which the contractor may have in respect of this contract or work done thereunder, are to be summarized and submitted by him (in duplicate), to the Engineer, together with his certificate of completion mentioned in clause 21, and he shall make no claim of any nature afterwards; and no claim not then made, or allowed by the Engineer shall be sustainable, and the Engineer shall be in no way disentitled to determine any and all question or questions concerning said claims, except by his personal fraud, and this submission and reference to the Engineer may be made a rule of court, and no action or suit shall be commenced by either party to the contract until after the "completion certificate for payment" shall have been signed by the Engineer, and then only for the amount appearing thereby to be due to the said contractor.

Others' rights

24. The contractor must afford all necessary and reasonable facilities to the Corporation, or any of their employees or workmen, as well as to any company, corporation or party owning or operating any railway, tramway, wires, pipes, or conduits, or other works or property, on, along, or near the line of the works, or in their vicinity; he shall notify all such parties before interfering with any of their property, rights or privileges, and must work in harmony with them as far as he possibly can; otherwise he shall notify the Engineer, in writing, of his failure so to do, or of any difficulty that may at any time arise which he may be unable to overcome, in which case the Engineer shall deal with the matter as in his judgment may seem right and proper, and the contractor shall abide by the decision and directions of the said Engineer. Any property of such parties which the Engineer orders to be moved by the contractor, must be handled with care, and must be neatly piled up and preserved free from injury or loss.

and must be properly and satisfactorily replaced if so required under any of the provisions of this contract, all of which must be done by the contractor without extra charge, and to the Engineer's satisfaction. The Engineer shall have the right, at any time before, during the construction, or after the completion, of the work, to open up any portion of the work or works, or of the ground or roadway, or to grant permission for such opening to be made or left by the contractor, as he, the said Engineer, may deem advisable, for the purpose of examining, repairing or laying any water, gas or other pipe, sewer, drain, track or other construction, or to cause any such work as he may deem necessary or advisable to be done, and such permission, or the exercise of such rights, either by the Engineer or by any other person or corporation having the requisite authority (either statutory or otherwise), shall not relieve the contractor from any of his responsibilities or obligations, nor shall the opening up of any portion of the work for these or any other purposes, or by any other parties, relieve the contractor of such responsibilities or obligations, except only for the portion of the work actually torn up and destroyed, and then only in case the contractor applies in writing for such relief at the time the work is being done, or within ten days afterwards, and can furnish sufficient cause, in the Engineer's opinion, why such relief should be granted.

Workmen's rights

25. The contractor shall pay or cause to be paid to all mechanics, workmen and laborers employed by him or by any sub-contractor under him in the execution of this contract, the union or prevailing rate of wages for such work as the said mechanics, workmen and laborers may be engaged upon, and being the rate of wages prevailing at the date of this contract, and which shall remain at the said rate until the completion thereof; and the contractor shall pay or cause to be paid to all workmen employed by him or by any sub-contractor under him in the execution of this contract the minimum wage of twenty-five (25) cents per hour.

The decision of the Fair Wage Officer in case of dispute as to the rate of wages to be paid under this contract, or as to the amount to be paid to any mechanic, workman or laborer, shall be final and binding upon all parties.

In case the contractor fails to pay any mechanic, workman or laborer employed by him in the execution of this contract, the rate of wages hereinbefore provided, the Corporation may pay any balance necessary to make up this amount, and charge it to the contractor.

The contractor shall not compel or permit the workmen he employs to work more than nine hours a day, except in cases of emergency, and then only by written permission of the City Engineer. The provisions of this clause shall not, however, apply to any work which is of necessity done outside the City of Toronto.

Liens

26. All contract moneys, and the said works, and every part thereof, shall be and continue free from, and not liable to, any lien or charge at law or in equity, or to any claim or liability under the Mechanics' Lien Acts, or Patent Right Law, or to any attachment for debt, or garnishee process or otherwise, and the parties hereto and their bondsmen or sureties or themselves, their executors, administrators, successors and assigns, and any and all other parties

in any way concerned, shall fully indemnify the Corporation and all their officers, servants and employees, from any and all such liability.

Inspectors' powers

27. Inspectors are required to see that the provisions of the specifications are faithfully adhered to, especially as regards the quality of the workmanship and materials, and shall have the power to suspend any workman for incompetency, drunkenness or negligence or disregard of orders. An inspector may stop the work entirely if there is not a sufficient quantity of suitable and approved material on the ground to carry it on properly, or for any other good and sufficient cause. Any work done in the absence of an Inspector may be ordered to be opened up for thorough examination, and must be rebuilt or replaced as directed, and at the contractor's sole expense, but no approval by any Inspector shall be taken as, or construed into, an acceptance of defective or improper work or material, which must, in every case, be removed and properly replaced whenever discovered at any stage of the work. Orders given by Inspectors relating to the quality of material and workmanship, must be at once obeyed by the contractor, but Inspectors have not the power to set out work, or give any stakes, lines, gauges, levels or grades. Any orders or directions other than as herein provided for, given by Inspectors, shall not be binding upon the Corporation.

Engineer's absence

28. In the absence of the Engineer, any of his Assistant Engineers, whom he may designate to superintend the works, shall have (subject to the instructions of the Engineer) full power to decide as to the manner of conducting and executing the works in every particular, and the contractor shall follow the instructions or orders of the person so designated.

Contractor's absence

29. In the absence of the contractor from the works (whether permanent or temporary), he must provide and leave a competent and reliable agent or foreman in charge for him, and such person shall be considered as acting in his place, and all notices, communications, orders or instructions given or sent to or served upon such person shall be taken as served upon the contractor.

Notice to contractor

30. Any notice or communication to the contractor shall be deemed to be well and sufficiently given and served if handed to the contractor or any of his clerks or agents, or if posted or sent to the address given in his tender for the work, attached hereto, or to his domicile or usual place of business, or to the place where the work is to be or is being carried on, or if posted to or left at his last known address; and any papers so left, sent or addressed shall be considered to be, and to have been, legally served upon the said contractor. In any written or printed notice to the contractor in respect of general, special, or other repairs, or of any work of any nature required to be done under any of the provisions of the contract, or of any other matter, it shall not be obligatory upon the Engineer to specify minutely or in detail everything required, nor to specify by measurement the exact extent thereof, or the precise spot or spots where the work or material may be defective or faulty, or where any of the requirements of the specifications have not been observed; but a reference in such notice to the clause or clauses bearing upon the matter, and a description of the locality in general terms, and sufficiently clear, in the Engineer's opinion, to indicate where the defect or trouble exists, shall be deemed to be, and shall be, ample notice.

Payments

31. The contractor shall be entitled to receive monthly payments at the rate of 85 per cent. of the value of work actually done and materials in place, according to the Engineer's estimate, less all stipulated forfeitures and deductions. These payments shall be made on progress certificates, which will be based on approximate estimates only, and must not be taken or construed as an acceptance of the work so estimated, or as an admission that the Corporation is in any way liable to the contractor in respect thereof.

The fifteen per cent. drawback from each monthly payment shall, subject to the discretion of the Engineer, be paid the contractor after the expiration of one year from the date of the progress certificate on which such monthly payment was made. On the completion of the work or as soon thereafter as practicable, a certificate marked "Completion Certificate for Payment" shall be issued, whereby the contractor shall receive the whole amount remaining due under the contract, including extras, less forfeitures, deductions and drawbacks for the previous twelve months as referred to above. At the end of the period of guaranteed maintenance, and after the provisions of the contract have been fully complied with, the final certificate for the balance due (if any), shall be issued and paid to the contractor.

Interest at the rate of 4 per cent. per annum from the date of the completion certificate will be allowed the contractor on all moneys due him after the payment of such certificate.

All payments to the contractor shall be made out of the funds under the control of the Corporation in their public capacity, and no member of the City Council or officer of the Corporation is, or is to be held, personally liable or responsible to the contractor under any circumstances whatever.

Tenders

32. All tenders for the execution of the works herein set forth or referred to must be made on the printed forms supplied for that purpose. None others will be received. Tenderers are required to state in their tender their name and places of residence (or in case of an incorporated company the corporate name, by whom incorporated, and the location of the head office). Also that it is made without any knowledge, comparison of figures or arrangement with any other person making any bid or estimate for the same purpose, and that it is in all respects fair and without collusion or fraud, and that no member of the Council, or any officer of the Corporation is, shall be, or become, interested, directly or indirectly, as contracting party, partner, surety or otherwise in, or in the performance of the contract, or in the supplies, work or business to which it relates, or in any portion of the profits to be used therein or thereof, or in any of the moneys to be derived therefrom. The tender or estimate must be verified by the Statutory Declaration of the party or parties making the estimate that the several matters stated therein are in all respects true. Tenders are to be made in the form of a lump sum, unless otherwise specified, which sum must cover the cost of the completion of the work in every respect, in accordance with the Contract, Specifications and Plans, including all labor, plant, tools, etc. Contractors are required to fully satisfy themselves as to the practicability of the works, and every part thereof, before tendering thereon, and the contractor, by his signature hereto, assumes all responsibility in respect thereof.

Sub-letting

33. The contractor shall keep the work under his personal control and shall not assign, transfer, or sub-let any portion without first obtaining the written consent of the Engineer.

The consent of the Engineer to any such assignment, transfer, or sub-letting, shall not, however, relieve the contractor of any responsibility for the proper commencement, execution, and completion of the work according to the terms of the contract; and the contractor shall, either in person or through an accredited agent, receive all notices, communications, orders, instructions, or legal service, as if he were performing the work with his own plant and his own men.

Forfeiture of contract

34. If the contractor shall neglect or refuse to sign the plans before commencing work, or neglect or fail to commence work within four days after the date of the Engineer's order to commence, or if he shall become bankrupt or insolvent, or compound with his creditors, or commit any act of insolvency, or shall transfer, assign or sub-let, or attempt to transfer, assign or sub-let this contract, or any part thereof, without the consent of the Engineer; or if at any time the works, or any part thereof, is, in the judgment of the Engineer, not executed or not being executed in a sound and workmanlike manner, to his satisfaction and in all respects in strict conformity with the contract, or if the work or any part thereof, is not progressing continuously and in such a manner as to ensure its entire completion, in the Engineer's judgment, within the time stipulated, or if the contractor shall refuse or neglect forthwith, when so ordered, to conduct the work so as to ensure its completion, in the opinion of the Engineer, within the time stipulated, or if the said time has expired and the work be not completed, or if the contractor shall refuse, or neglect, to take down, re-build, repair, alter or amend any defective or unsatisfactory work, or to remove any condemned material or workmanship, and to replace the same with proper material and workmanship, or to comply with any reasonable order he may receive from the Engineer, or if the contractor shall persist in any course in violation of any of the provisions of this contract, then, in each and any such case, after 24 hours' written notice from the Engineer, to the Contractor, the Engineer shall have the full right and power, at his discretion, without process or action at law, to take the whole work, or any part or parts thereof specified in the said notice, out of the hands of the contractor, and the contractor upon receiving notice to that effect, shall vacate possession and give up the said work, or the part or parts thereof specified in the said notice, peaceably to the Engineer, who may either re-let the same to any other person or persons, with or without its being previously advertised, or may employ workmen and provide materials, tools, transportation and all other necessary things at the expense of the contractor, or may take such other steps as he, the said Engineer, may consider necessary or advisable, in order to secure the completion of the said work to his satisfaction; and the contractor and his sureties in every case shall be liable for all damages, expenditure and extra expenditure, and for all additional cost of the work which may be incurred by reason thereof, together with the penalties from the date fixed for the completion of the work, and the same may be de ucted or collected by the Corporation, as provided by section 38 hereof. And all the powers of the said Engineer with respect to the determination of any doubts, disputes and differences, and the determination of the sum or sums, or balance of money to be paid to or received from the said contractor, and otherwise in respect of the contract, shall nevertheless continue in force. The fulfilment by the contractor of any stipulation in this contract may be enforced by legal proceedings and judgment, or order of court, without prejudice to any other remedy herein contained.

In case the work, or any part thereof, is taken out of the hands of the contractor, as herein

provided, it shall in no way affect the relative obligations of the Corporation and the contractor, or his sureties, in respect of his or their obligation, or in respect of the remainder of the work (if any), nor shall it be any excuse for delay in completing the same; and all material, plant, scaffolding, scantlings, cofferdams, dredges, pumps and pumping machinery, fixed tackle and other erections, appliances and plant thereon, shall, at the option of the Engineer, remain on the work until completion, at such a rental (if any) as the Engineer may consider reasonable. And if any balance of the contract price, or other money payable by the Corporation hereunder, shall remain in the hands of the Corporation upon the expiration of the period of guarantee, the same shall be payable to the contractor or the person legally representing him; but neither the Corporation nor any officer thereof shall be liable or accountable to the contractor in any way for the manner in which, or the price at which, the said work, or any portion thereof, may have been or may be done or completed by the said Engineer.

Bribery

35. Should the contractor or any of his agents give or offer any gratuity to, or attempt to bribe, any member of the City Council, officer or servant of the Corporation, the City Council shall be at liberty to cancel the contract forthwith, or to direct the Engineer to take the whole or any part of the works out of the hands of the contractor, under the same provisions as those specified in preceding section.

Discharge of employees

36. Should any overseer, mechanic or workman employed on or about the work or in connection therewith, give any just cause for complaint (of which the Engineer shall be the sole judge), the Engineer may dismiss such person forthwith, and he shall not be again employed by the contractor on any Corporation work without the consent, in writing, of the Engineer.

Contractor's liability

37. The contractor shall be responsible for any and all damages, or claims for damages for injuries or accidents done or caused by him or his employees, or resulting from the prosecution of the works, or any of his operations, or caused by reason of the existence or location or condition of the works, or of any materials, plant or machinery used thereon or therein, or which may happen by reason thereof, or arising from any failure, neglect or omission on his part, or on the part of any of his employees, to do or perform any or all of the several acts or things required to be done by him or them under and by these conditions, and covenants and agrees to hold the Corporation harmless and indemnified for all such damages and claims for damage; and in case of the contractor's failure, neglect or omission to observe and perform faithfully and strictly, all the provisions of these conditions, the Engineer may, either with or without notice (except where in these conditions notice is specially provided for, and then upon giving the notice therein provided for), take such steps, procure such material, teams and men, and do such work or things as he may deem advisable towards carrying out and enforcing the same, and any and all expenses so incurred may be deducted or collected by the Corporation under the provisions of section 38 of these Conditions, and any such action by the Engineer, as he is herein empowered to take, shall not in any way relieve the contractor or his sureties from any liability under the contract.

Moneys due City

38. All moneys payable to the Corporation by the contractor under any stipulation herein, may be retained out of any moneys then due, or which may become due, from the said Cor-

poration to the contractor under this or any other contract with the Corporation, or otherwise howsoever, or may be recovered from the contractor or his sureties, or any or either of them, in any court of competent jurisdiction, as a debt due to the Corporation; and the Engineer shall have full power to withhold any estimate or certificate, if circumstances arise which may indicate to him the advisability of so doing, though the sum to be retained may be unascertained.

Approval of drawings

39. The contractor shall submit for the Engineer's approval as many copies as he may require of all working or other drawings, as well as details of falsework, and diagram of arrangement of plant; and shall do no work on any portion until the drawings pertaining to the same have been approved by the Engineer. Such approval shall not relieve the contractor from responsibility for errors or omissions or of any other obligations imposed by this contract.

Railway Protections

40. The contractor shall arrange with the Railway Companies over whose tracks the viaduct is to be constructed regarding the location of falsework, handling of material and prosecution of work on their property, and shall fully indemnify the City against all claims arising from injury or damage to persons, railway property or traffic, by reason of his operations; and he shall bear the whole expense of all watchmen, flagmen, and other safeguards required, whether furnished by him or by the railway companies, together with all other expenditures arising therefrom or caused thereby.

Definitions

41. Wherever used in these specifications the word "City" or "Corporation" means "the Corporation of the City of Toronto." and the word "Engineer," or "City Engineer," means the person for the time being filling the office of Commissioner of Works and City Engineer of the City of Toronto, or the person then acting as such. The word "Contractor," or a pronoun in place thereof, means the person or persons who have undertaken to carry out this contract. The word "plans" means all plans, profiles, drawings, sketches or copies thereof exhibited, used or prepared for or in connection with the work embraced under the contract. The word "plant" mean every temporary or accessory means necessary or required to carry on or complete the works and extra works, in the time and manner herein provided; and all temporary materials built in the works, which cannot (in the opinion of the Engineer) be removed without injury to the works or extra works, including (without thereby limiting the foregoing definition) all temporary buildings, workshops, sheds, and erections, enclosures, fences, gates, and entrances, bridgeways, boarding, tramways, fixed and movable machinery, engines, dredges, steamboats, barges, row boats and sail boats, tugs and scowes, vehicles, carts, stages, scaffolding, centering, temporary props, shores, pumps, dams, cofferdams, moulds, templates, utensils, ladders, barrows, timbers, planks, coal and other fuel, lighting, water for the works, and power of every kind, struts, needles, wedges, cleats, spikes, screws, bolts and nuts, chains, ropes, cordage, tools, implements and tackle, tarpaulins and coverings for the works, casings and packings, and all special or other appliances of every sort, kind and description whatsoever.

Whenever the words "authorized," "directed," "required," "requested," "approved," "ordered," "sanctioned," and "satisfactory," occur in the Specifications, unless some other

meaning is obvious from the context, they shall mean respectively authorized, directed, required, requested, approved, ordered or sanctioned by or satisfactory to the City Engineer.

The word "work" or "works" shall (unless the context requires a different meaning) mean the whole of the works, materials, matters and things required to be done or supplied, mentioned or referred to in the tender, specifications, plans, profiles and drawings, including all extra or additional work or material, matters or things which may be ordered by the Engineer, as herein provided.

The word "contract" herein, and in any agreement, bond, specification, condition or plan herein referred to, means and includes the agreement to do the work entered into with the Corporation, the bond or security, the specification or specifications, the plans, the tender and other documents referred to or connected with the said agreement.

The words "shall," "may," "herein," "person," "writings" or "written," "sureties," and "security," and words used in the singular number or the masculine gender, shall have the meaning and effect as given in the Interpretation Act of the Revised Statutes of Ontario.

☞ This is the form of Agreement referred to in the annexed Bond, Tender and Specifications and in the Plans and Profiles therein referred to, and, with such Documents and Plans, forms the Contract in this matter.

This Agreement made (in triplicate) the

day of one thousand nine hundred and

Between

of the City of Toronto, in the County of York, hereinafter called the Contractors, of the First Part, and **The Corporation of the City of Toronto**, hereinafter called the City, of the Second Part.

Whereas the said City did award to the said Contractor the Contract for

in the City of Toronto, according to the Plans and Specifications herein referred to and marked "A," the said Contractors having put in a Tender therefor, a copy of which is hereto annexed and marked "B," which said Tender was accepted by Report No.
of the said Board of Control for 19 , adopted in Council on the day of 19

Now these Presents Witness that the said Contractors for themselves, and their several successors, heirs, executors, administrators and assigns, covenant with the said City to do the whole of the works herein mentioned with due expedition and in a thoroughly workmanlike manner, in strict accordance with the provisions of this agreement, and the said specifications and the plans therein referred to (which are identified by the signature of the said Contractors, and are made part of this contract as if embodied herein). And thereafter maintain the same as therein provided, and covenant and agree to and with the said City that they will carry out, do, perform and observe, and be bound by all the covenants, agreements, stipulations, provisoes and conditions to be carried out, done, performed and observed by them, to the same extent and as fully as if each of them was set out in and specifically repeated in this agreement.

In this agreement, and in the contract, of which this agreement forms a part, the words "person," "plan," "shall," "may," "herein," "work," "works," "contract," "contractors," "Commissioner," and words used in the singular number of the masculine gender, shall have the meaning and effect given to them in the Specifications hereto annexed, or in the Interpretation Act of the Revised Statutes of Ontario.

The said City covenants with the said Contractors that if the said work, including all extras in connection therewith, shall be duly and properly executed as aforesaid, and if the said Contractors shall observe and keep all the provisoes, terms and conditions of this contract, they, the said City, will pay the said Contractors therefor the amounts or at the rates (which are to apply to all extras of the character specified in the schedule of rates forming part of said Tender), and in the manner and subject to the drawbacks and penalties mentioned in the said Tender and Specifications, upon estimates or certificates signed by the Commissioner, subject to the provisions of By-law No. 4294 of the City of Toronto, relating to Corporation contracts, which provisions are hereby incorporated with and made part of this contract, Provided that no money shall become due or be payable under this contract unless and until an estimate or certificate therefor shall have been signed by the Commissioner as herein provided, the possession of which is hereby made a condition precedent to the Contractors' right to be paid or to maintain any action for such money or for any part thereof. Provided also, that the said City shall not be liable to pay for work rejected or condemned by the said Commissioner, or to pay any money upon any estimate or certificate until the work so rejected or condemned has been replaced by new material and workmanship, to the written satisfaction of the said Commissioner, or to pay for any extras or additional work or materials not included in this contract, except only in the manner and as provided for herein; and it is hereby expressly provided that the granting of any estimate or certificate, or the payment of any moneys thereunder, shall not be construed as an acceptance of any bad or defective work or material, to which the same relates, or as an admission of liability to pay any money in respect thereof, and shall in no way lessen the liability of the Contractors to replace such work or material, though the condition of the same may not have been discovered by the Commissioner at the time such certificate was given or acted upon.

And the said Contractors covenant as aforesaid with the said City to indemnify and keep indemnified the said City, and each of the officers, servants and agents thereof, from all and all

manner of loss, damage, injury, actions, suits, claims, liens and demands on account of the said works, or which may be incurred by reason or in consequence of the execution or non-execution or imperfect execution thereof, or the supply or non-supply of plant or material therefor.

And to pay to the said City, and to such officer, servant or agent thereef, on demand, any expense, loss, costs or damage which may be sustained by them or any of them in consequence of any such action, suit, claim, lien or demand, and any moneys paid by them or any of them in settlement or in discharge thereof, or on account thereof, and that any moneys so paid or payable by the said City, and any money payable by the Contractors under any of the clauses of this contract may be deducted from any moneys of the said Contractors then remaining in the hands of the City on account of this or any other contract, or may be recovered from the Contractors or their sureties as moneys paid at their request. And the said Contractors hereby authorize and empower the said City or their Solicitor for the time being, to defend, settle or compromise any of such actions, suits, claims, liens or demands as the said City or their said Solicitor may deem expedient, and also hereby agree to ratify and confirm all the acts of the said City or their Solicitor in that behalf, and to pay to the said Solicitor on demand his reasonable costs of defending such suits or claims as he may deem it expedient to defend, and that the same may be deducted from any moneys payable by the said City to the said Contractors on any account whatever.

In witness whereof the said parties to these presents have hereunto set their hands and seals the year and day above written, that is to say, the said parties of the first part their proper hand and seal, and the said parties of the second part their Corporate Seal, by

Esquire, Mayor,

countersigned by JOHN PATTERSON, Esquire, Treasurer of the said City.

N.B. Contractors will please read the above before execution.

Signed, Sealed and Delivered,

IN THE PRESENCE OF

Mayor.

Treasurer.

BOND.

Know all Men by these Presents, that

of the City of Toronto, in the County of York, and hereinafter called the Principals of the same place.

and of the same place, hereinafter called the sureties, are severally held and firmly bound unto THE CORPORATION OF THE CITY OF TORONTO, each in the penal sum of

Dollars of lawful money of Canada, to be paid to the said THE CORPORATION OF THE CITY OF TORONTO, or to their certain Attorneys, successors or assigns, for which payment well and truly to be made, we jointly and severally bind ourselves, our and each of our several and respective heirs, executors, administrators and successors, and every of them for ever, firmly by these Presents. Sealed with our several and respective seals.

Dated this day of in the year of our Lord one thousand nine hundred and

Whereas by certain Articles of Agreement, bearing even date with the above obligation, the above bounden Principals have contracted and agreed with the above-named THE CORPORATION OF THE CITY OF TORONTO, to

in the City of Toronto, in the said Articles of Agreement and in the Plans, Profiles and Specifications therein more particularly mentioned and described, at the prices and upon the terms and conditions in the said Articles of Agreement, Plans, Profiles and Specifications more fully

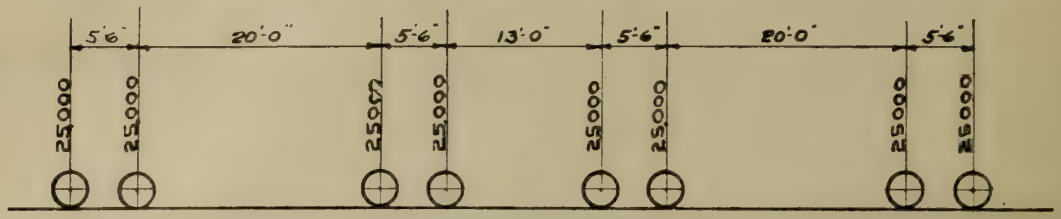
set forth, all of which are herein called the said Contract, and having been required to furnish good and sufficient security for the due and proper fulfilment of the said Contract, the above bounden Sureties have consented to become such security, and to execute these Presents.

Now the Condition of the above obligation is such, that if the above bounden Principals shall well, truly and faithfully in all respects, perform, execute and carry out the said Contract, and all the terms and conditions thereof to the satisfaction of the Commissioner of Works, and of the said THE CORPORATION OF THE CITY OF TORONTO, and shall keep and maintain in good working order and complete repair the whole of the work performed under the said Contract including any extra work which may be ordered pursuant thereto for the period in said Contract mentioned, and shall then forthwith hand over the same to the said Corporation completed and in perfect order and repair, as in said Contract provided, and shall at all times indemnify and keep indemnified the said THE CORPORATION OF THE CITY OF TORONTO, and all the officers, servants and agents thereof from all and all manner of loss, damage, expense, suits, claims, liens and demands arising out of the said Contract, or incurred by reason of the execution of the said work, or the supply of material therefor, according to the terms of the said Contract, then this obligation to be null and void, otherwise to remain in full force and virtue.

And it is hereby declared and agreed that the above bounden Sureties shall be liable as Principals, and that nothing of any kind or matter whatsoever that will not discharge the said Principals shall operate as a discharge or release of liability of the said Sureties, or any or either of them, any law or usage relating to the liability of Sureties to the contrary notwithstanding.

Signed, Sealed and Delivered,
IN THE PRESENCE OF

LOADING DIAGRAMS.



FIGURES FOR 2 RAILS

FIG. 1 50 TON ELECTRIC CAR FOR UPPER DECK

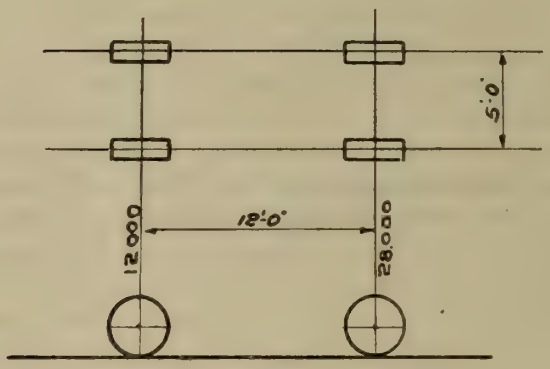
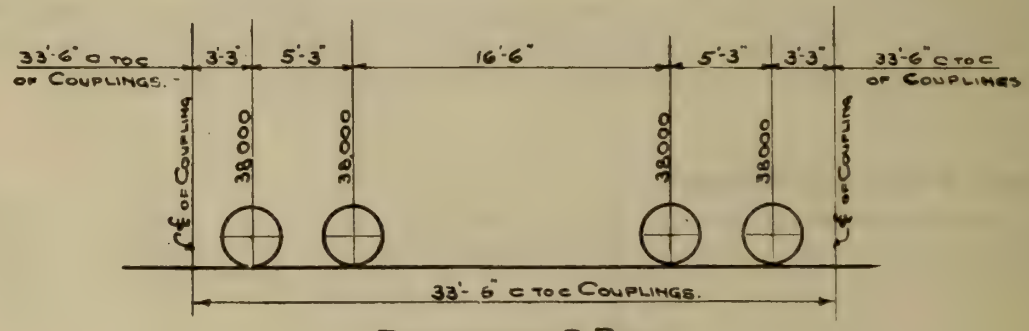


FIG. 2 20 TON MOTOR TRUCK



FIGURES FOR 2 RAILS

FIG. 3 TRAIN OF CARS. LOWER DECK.

CLEARANCE DIAGRAM

Lower Deck.

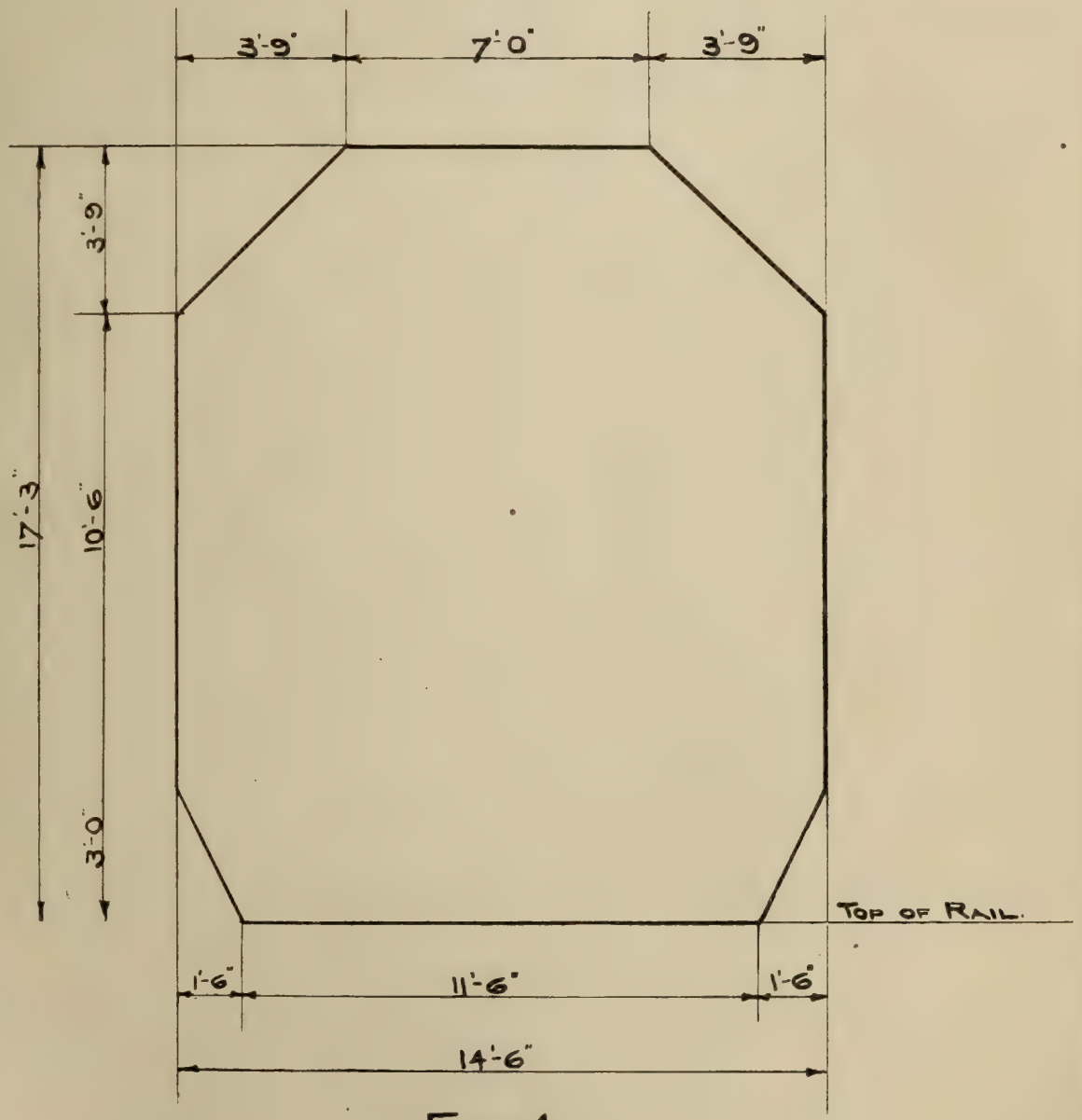


Fig. 4.